

## **TECHNICAL FISHERY REPORT 92-15**

---



Alaska Department of Fish and Game  
Division of Commercial Fisheries  
P.O. Box 25526  
Juneau, Alaska 99802-5526

October 1992

---

### **Bristol Bay Sockeye Salmon Spawning Escapement Test Fishing in 1991**

by

**Barry L. Stratton**

and

**James D. Woolington**

The Technical Fishery Report Series was established in 1987, replacing the Technical Data Report Series. The scope of this new series has been broadened to include reports that may contain data analysis, although data oriented reports lacking substantial analysis will continue to be included. The new series maintains an emphasis on timely reporting of recently gathered information, and this may sometimes require use of data subject to minor future adjustments. Reports published in this series are generally interim, annual, or iterative rather than final reports summarizing a completed study or project. They are technically oriented and intended for use primarily by fishery professionals and technically oriented fishing industry representatives. Publications in this series have received several editorial reviews and at least one *blind* peer review refereed by the division's editor and have been determined to be consistent with the division's publication policies and standards.

BRISTOL BAY SOCKEYE SALMON SPAWNING ESCAPEMENT TEST FISHING IN 1991

By

Barry L. Stratton

and

James D. Woolington

Technical Fishery Report No. 92-15

Alaska Department of Fish and Game  
Division of Commercial Fisheries  
Juneau, Alaska

October 1992

## **AUTHORS**

Barry L. Stratton is a Region II Bristol Bay Research Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries, 333 Raspberry Road, Anchorage, AK 99518.

James D. Woolington was a Region II Bristol Bay Research Biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries, P.O. Box 230, Dillingham, AK 99576, and is a Wildlife Biologist for the Alaska Department of Fish and Game, Division of Wildlife Conservation, P.O. Box 47, Glennallen, Alaska, 99588.

## **ACKNOWLEDGMENTS**

The following Alaska Department of Fish and Game, Division of Commercial Fisheries, employees worked on river test fish projects in 1991: Richard Conklin (Igushik River), Brad Fisher (Ugashik River), Lance Lamb (Ugashik River), Darrin Lawless (Kvichak River), Robert McFadden (Kvichak River), Patrick Regnart (Egegik River), Brad Russell (Egegik River), and Jeff Wadle (Igushik River). They worked long, irregular hours under difficult and hazardous conditions. The projects could not have been completed without their dedication.

## TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES .....	iv
LIST OF FIGURES .....	v
LIST OF APPENDICES .....	vi
ABSTRACT .....	vii
INTRODUCTION .....	1
MATERIALS AND METHODS .....	1
Test Fishing .....	1
Data Analyses .....	2
RESULTS AND DISCUSSION .....	6
Kvichak River .....	6
Egegik River .....	7
Ugashik River .....	8
Igushik River .....	9
LITERATURE CITED .....	10
TABLES .....	12
FIGURES .....	26
APPENDIX .....	39

## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Sockeye salmon spawning escapement test-fishing data summary, Kvichak River, 1991 .	12
2. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1985-1990: EPI=119) for test-fishing data and visual counts from observation towers, Kvichak River, 1991 . . . . .	13
3. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Kvichak River, 1991 . . . . .	14
4. Sockeye salmon spawning escapement test-fishing data summary, Egegik River, 1991 . .	15
5. Comparison of sockeye salmon spawning escapement estimates based on catchability analysis of test-fishing data and visual counts from observation towers, Egegik River, 1991 . . . . .	16
6. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1985-1990: EPI=70) for test-fishing data and visual counts from observation towers, Egegik River, 1991 . . . . .	17
7. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Egegik River, 1991 . . . . .	18
8. Sockeye salmon spawning escapement test-fishing data summary, Ugashik River, 1991 .	19
9. Comparison of sockeye salmon spawning escapement estimates based on catchability analysis of test-fishing data and visual counts from observation towers, Ugashik River, 1991 . . . . .	20
10. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1985-1990: EPI=37) for test-fishing data and visual counts from observation towers, Ugashik River, 1991 . . . . .	21
11. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Ugashik River, 1991 . . . . .	22
12. Sockeye salmon spawning escapement test-fishing data summary, Igushik River, 1991 .	23
13. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1988-1989: EPI=26) for test-fishing data and visual counts from observation towers, Igushik River, 1991 . . . . .	24
14. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Igushik River, 1991 . . . . .	25

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Comparison of 1985-1990 mean EPI value sockeye salmon escapement forecast and actual escapement, Kvichak River, 1991 . . . . .	26
2. Comparison of travel time analysis sockeye salmon escapement forecast and actual escapement, Kvichak River, 1991 . . . . .	27
3. Comparison of catchability analysis sockeye salmon escapement forecast and actual escapement, Egegik River, 1991 . . . . .	28
4. Comparison of 1985-1990 mean EPI value sockeye salmon escapement forecast and actual escapement, Egegik River, 1991 . . . . .	29
5. Comparison of travel time analysis sockeye salmon escapement forecast and actual escapement, Egegik River, 1991 . . . . .	30
6. Comparison of catchability analysis sockeye salmon escapement forecast and actual escapement, Ugashik River, 1991 . . . . .	31
7. Comparison of 1985-1990 mean EPI value sockeye salmon escapement forecast and actual escapement, Ugashik River, 1991 . . . . .	32
8. Comparison of travel time analysis sockeye salmon escapement forecast and actual escapement, Ugashik River, 1991 . . . . .	33
9. Comparison of 1988-1989 mean EPI value sockeye salmon escapement forecast and actual escapement, Igushik River, 1991 . . . . .	34
10. Comparison of travel time analysis sockeye salmon escapement forecast and actual escapement, Igushik River, 1991 . . . . .	35

## LIST OF APPENDICES

	<u>Page</u>
APPENDIX A: KVICHAK RIVER	
A.1. Sockeye salmon test-fishing data, Kvichak River, 1991 .....	39
A.2. Age, sex, and size composition of sockeye salmon caught in the Kvichak River test fishery, 1991 .....	42
A.3. Kvichak River sockeye salmon test-fishing data, 1979-1991 .....	43
A.4. Climatological and hydrological observations made at Kvichak River sockeye salmon test-fishing site, 1991 .....	44
APPENDIX B: EGEGIK RIVER	
B.1. Sockeye salmon test-fishing data, Egegik River, 1991 .....	45
B.2. Age, sex, and size composition of sockeye salmon caught in the Egegik River test fishery, 1991 .....	49
B.3. Test-fishing data, 1979-1990, to estimate constants for 1991 Egegik River catchability model .....	50
B.4. Climatological and hydrological observations made at Egegik River sockeye salmon test-fishing site, 1991 .....	51
APPENDIX C: UGASHIK RIVER	
C.1. Sockeye salmon test-fishing data, Ugashik River, 1991 .....	52
C.2. Age, sex, and size composition of sockeye salmon caught in the Ugashik River test fishery, 1991 .....	56
C.3. Test-fishing data, 1979-1990, to estimate constants for 1991 Ugashik River catchability model .....	57
C.4. Climatological and hydrological observations made at Ugashik River sockeye salmon test-fishing site, 1991 .....	59
APPENDIX D: IGUSHIK RIVER	
D.1. Sockeye salmon test-fishing data, Igushik River, 1991 .....	60
D.2. Age, sex, and size composition of sockeye salmon caught in the Igushik River test fishery, 1991 .....	66
D.3. Igushik River sockeye salmon test-fishing data, 1979-1989, and 1991 .....	67
D.4. Climatological and hydrological observations made at Igushik River sockeye salmon test-fishing site, 1991 .....	69

## ABSTRACT

Drift gillnets were fished daily at two stations, or test fish sites, located on opposite river banks prior to every high slack tide in Kvichak, Egegik, Ugashik, and Igushik Rivers, Bristol Bay, Alaska, from mid-June to mid-July to estimate 1991 sockeye salmon spawning escapements. Accurate escapement estimates were made at counting towers. However, because it took sockeye salmon 1-5 d to reach tower sites after passing test fish sites, the test fish projects provided fishery managers with preliminary escapement information. This early information enabled managers to better control commercial harvests and achieve escapement goals. The daily test-fish index for each river was the mean of catch per unit effort values obtained from all sets made the same day. Numbers of sockeye salmon that escaped the commercial fishery were estimated using (1) travel time analysis in which the most recent cumulative tower count was divided by cumulative test fish indices and lagged back in time by daily increments, (2) a power curve (catchability model) calculated from mean length (independent variable) and escapement per index point (EPI) values from past years (dependent variable), and (3) the mean EPI value. Escapement estimates based on travel time for Kvichak, Egegik, Ugashik, and Igushik Rivers were more accurate and less biased than estimates based on catchability models or mean EPI values. However, catchability and mean EPI estimates were available on the first day of each project while travel-time estimates could not be made until 5 d of test fishing data and tower counts were collected.

**KEY WORDS:** Sockeye salmon *Oncorhynchus nerka*, test fishing, spawning escapement estimation, fisheries management, Bristol Bay

## INTRODUCTION

In rivers, test fishing is used to estimate numbers of salmon which have escaped commercial fishing districts and entered river systems to spawn; in Bristol Bay, river test fisheries are used to manage sockeye salmon *Oncorhynchus nerka*. Test-fishery data are available approximately 1 d after sockeye salmon have passed through the commercial fishing district and several days earlier than estimates based on visual counts from towers located at the head of the river systems. Spawning escapement estimates based on test-fish data assist management biologists in regulating commercial fishing periods to maximize harvests and achieve escapement goals. Test-fishing projects have been operated on Kvichak River since 1960, on Egegik River since 1963, on Ugashik River since 1961, and on Igushik River since 1976 (McBride 1978; Paulus 1965). This report summarizes test-fish data collected in 1991 and evaluates the accuracy of forecasting methods used during the 1991 season.

## MATERIALS AND METHODS

### *Test Fishing*

Two stations on opposite river banks were fished in the lower section of Kvichak, Egegik, Ugashik, and Igushik Rivers. Test-fish stations were close to the commercial fishing district boundary but above sockeye salmon milling areas. Stations fished on at all four rivers were the same as in 1987 (Fried and Bue 1988a).

Gillnets were drifted at all test fish sites to estimate sockeye salmon abundance. All drifts were made perpendicular and close to shore because sockeye salmon migrate parallel to and near the river bank. Two short drifts of < 15 min duration were made at each Igushik River station about 1.5 h before every high slack tide for the entire season as currents tended to carry the gillnet offshore. Two drifts were made at each station about 1.5 h before every high slack tide early in the season at Egegik and Ugashik Rivers. When the estimated sockeye escapement reached 10-15% of the point goal, only one drift was made at each station for the remainder of the year. One drift was made at each Kvichak River station about 1.5 h before every high slack tide for the entire season. Drifts at all stations were ended when about 30 sockeye were caught, or when the inshore end of the net drifted about 25 m offshore and lost efficiency.

All gillnets were 45.7 m (150 ft or 25 fathoms) in length and 29 meshes deep. Monotwist web, hung even and dyed Momoi shade #1, was used for test fishing on all rivers. Multistrand monofilament had been used in the past, however, this web type is now illegal for commercial use and is no longer stocked by suppliers. A stretched mesh size of 12.70 cm (5 in; #50 twine) was used on Kvichak River and 13.02 cm (5-1/8 in; #50 twine) was used on Egegik, Ugashik, and Igushik Rivers.

Catch per unit of effort (CPUE), or the number of sockeye salmon caught in 180 m (600 ft or 100 fathoms) of gillnet fished for one hour, was calculated for each set. Most sockeye salmon captured during

test fishing were sampled for sex, age, and length data. About 20-30% of these sockeye salmon were also weighed.

Climatological data was collected at all test fish camps. Observations were recorded for sky condition, wind velocity (km/h), wind direction, and water temperature (°C).

### *Data Analyses*

Mean fishing time ( $MT$ ), in minutes, was calculated for each set as:

$$MT = SI - FO + \frac{(FO-SO) + (FI-SI)}{2} , \quad (1)$$

where:

$SO$  = time gillnet first entered water,

$FO$  = time gillnet was fully deployed,

$SI$  = time gillnet retrieval began, and

$FI$  = time gillnet retrieval completed.

The CPUE value ( $C_j$ ; number of sockeye salmon caught per 100 fathom hours) was calculated for set  $j$ , or

$$C_j = 6,000 \frac{N}{G \times MT} , \quad (2.1)$$

where:

$N$  = number of sockeye salmon caught;

$G$  = gillnet length in fathoms.

Then the daily test fish index,  $I_i$ , for day  $i$  was calculated as the mean of individual CPUE values obtained from sets made the same day, or

$$I_i = \frac{\sum_{j=1}^s C_j}{s} , \quad (2.2)$$

where:

$s$  = number of sets made during day  $i$  (usually four sets per day);

Weighted daily mean length and weight were calculated as follows:

$$D_i = \frac{\sum_{j=1}^s S_j \times C_j}{\sum_{j=1}^s C_j} , \quad (3.1)$$

where:

$D_i$  = weighted daily mean length or weight for day  $i$ , and

$S_j$  = mean length or weight for set  $j$ .

Weighted seasonal mean length and weight were recalculated daily as new information became available:

$$M_i = \frac{\sum_{k=1}^i D_k \times I_k}{\sum_{k=1}^i I_k} , \quad (3.2)$$

where:

$M_i$  = weighted seasonal mean length or weight through day  $i$ ;

$D_i$  = mean length or weight for day  $i$ .

Three methods were used to estimate daily spawning escapements: (1) travel-time ( $EPI_d$ ), (2) a catchability model ( $EPI_m$ ), and (3) mean EPI value ( $EPI_a$ ).

Travel-time estimates of spawning escapements were based on the number of days it took sockeye salmon to travel from test fish sites to counting tower sites. A range of travel-time estimates was calculated by matching daily test fish indices to daily tower counts. The number of sockeye salmon represented by each

index point was calculated by dividing the most recent cumulative tower count by cumulative test fish indices lagged back in time by daily increments such that

$$EPI_d = \frac{\sum_{i=1}^t E_i}{\sum_{i=1}^{t-d} I_i} , \quad (4)$$

where:

$EPI_d$  = number of sockeye salmon represented by each test fishing index point based on a travel-time of  $d$  days;

$E_i$  = number of sockeye salmon traveling past counting tower on day  $i$ ;

$t$  = day of most recent escapement estimate.

The best initial estimate of travel time produced the smallest squared sum of errors between daily cumulative test-fish indices and tower counts. However, travel times that seemed unrealistic based on results of past studies or produced unreasonable escapement estimates (e.g., less than actual escapement) were rejected even if they produced the best statistical fit to the data.

Total spawning escapement was then estimated as

$$\hat{E}_{t+d} = EPI_d \sum_{i=1}^t I_i , \quad (5)$$

where:

$\hat{E}_{t+d}$  = estimated number of sockeye salmon that will travel past counting tower on day  $t+d$ .

Catchability models were based on the relationship between weighted mean season length (independent variable) of sockeye salmon caught during test fishing and corresponding historic EPI values (dependent variable); these models were used to estimate daily spawning escapements in Egegik and Ugashik Rivers. The following power curve was used:

$$EPI_m = aM_i^b , \quad (6)$$

where:

$a$  and  $b$  = constants derived from a linear regression of 1979-1990 natural logarithm transformed data.

EPI estimates based on catchability models were not used if weighted mean lengths were outside of the range of data used to build models.

Total spawning escapement was then estimated as

$$\hat{E}_t = EPI_m \sum_{i=1}^t I_i \quad , \quad (7)$$

where:

$\hat{E}_t$  = estimated number of sockeye salmon to have traveled past test fish site by day  $t$ .

Although gillnet web type used has changed, we assumed that this did not affect CPUE or mean size of sockeye salmon caught. A previous study by Bue (1986) found no obvious differences in fishing efficiency or sockeye salmon size selectivity between web types used in Bristol Bay.

For equation (7) mean  $EPI_a$  values of 119 for Kvichak, 70 for Egegik, and 37 for Ugashik Rivers were used based on results of the past six years of test fishing (1985-1990); a mean  $EPI_a$  value of 26, based only on results of 1988 and 1989 test fishing was used for Igushik River (project was not operated in 1990).

Estimates based on catchability models and mean  $EPI$  values were used to estimate escapements until estimates based on travel time became available. Travel time was preferred because it usually provided more accurate escapement estimates (Fried and Bue 1988a, 1988b; Yuen et al. 1988; Stratton et al. 1990; Stratton 1990). Also, when aerial surveys were flown, escapement estimates made by management biologists were compared to test fishing estimates.

Three statistics were used to measure performance of the various escapement estimators. Percent error, PE, was used to measure daily performance:

$$PE = 100 \times \frac{T_{t,a} - \sum_{i=1}^{t+d} E_i}{\sum_{i=1}^{t+d} E_i} \quad , \quad (8)$$

where:

$T_{t,a}$  = estimated cumulative spawning escapement on day  $t$  based on method  $a$ .

Mean percent error, *MPE*, was used to measure bias:

$$MPE = \sum_{t=1}^n \left( \frac{100 \times T_{t,a} - \sum_{i=1}^{t+d} E_i}{\sum_{i=1}^{t+d} E_i} \right), \quad (9)$$

where:

$n$  = total number of days that escapement estimates based on test fishing were available

Mean absolute percent error, *MAPE*, was used to measure overall accuracy because it treated under- and over-estimation errors similarly;

$$MAPE = \sum_{t=1}^n \left| \left( 100 \times \frac{T_{t,a} - \sum_{i=1}^{t+d} E_i}{\frac{\sum_{i=1}^{t+d} E_i}{n}} \right) \right|, \quad (10)$$

## RESULTS AND DISCUSSION

### *Kvichak River*

Test fishing began 19 June and ended 17 July. A total of 2,420 sockeye salmon were caught, producing 56,669 index points (Table 1; Appendix A.1). A total of 1,888 sockeye salmon were sampled for sex, age, and length information; 341 were weighed (Appendix A.2). Weighted mean weight and length for the season were 2.3 kg and 529 mm (Table 1; Appendix A.3).

Spawning escapement estimates for 19 June to 28 June were based on the 1985-1990 mean  $EPI_a$  value of 119 (Table 2; Figure 1). Sufficient spawning escapement data was collected by 28 June to allow estimation of  $EPI_d$  values based on travel time (Table 3; Figure 2). Estimated travel-times during the season ranged from 1 to 2 d. On the last day of the season, the best estimate of travel-time was 2 d.

Daily spawning escapement estimates based on the 1985-1990 mean EPI value ranged from 100% less to 566% greater than visual counts from towers, assuming actual travel-time was 2 d (Table 2; Figure 1). Daily escapement estimates based on travel-time ranged from 12% less to 39% greater than tower counts (Table 3; Figure 2). Accuracy (MAPE) tended to increase during the season for travel-time analysis estimates. The 1985-1990 mean EPI value estimates were greater than tower counts from 29 June through the end of the season.

When both methods were compared, estimates based on travel-time analysis were more accurate (MAPE=7) and less biased (MPE=1) than estimates based on the 1985-1990 mean EPI value (MAPE=90, MPE=63; Tables 2, 3; Figures 1, 2).

Estimated travel time on 17 July, the last day of the project, was 2 d. The cumulative tower count on 19 July was 4,114,932 sockeye salmon. The travel-time analysis estimate of 4,050,909 was similar to the observed tower count, and the 1985-1990 mean EPI value estimate of 6,713,400 was 63% greater than the observed tower count.

Mean water temperature during the project was 11°C (Appendix A.4). Winds usually blew southeast. High winds prevented the test-fish crew from completing two drifts on 7 July, and two drifts on 16 July.

### *Egegik River*

Test fishing began 15 June and ended 12 July. A total of 31,066 daily index points were produced from a catch of 2,071 sockeye salmon (Table 4; Appendix B.1). A total of 1,690 sockeye salmon were sampled for sex, age and length information; 495 of these were weighed (Appendix B.2). Weighted mean weight and length for the season were 2.5 kg and 533 mm (Table 4; Appendix B.3).

Sockeye salmon escapement estimates based on a catchability model and the 1985-1990 mean EPI<sub>a</sub> value (70) were calculated as early as 15 June (Tables 5, 6; Figures 3, 4), and the average of the two estimates was used to estimate escapement from 15 to 28 June. Travel-time estimates were first available on 28 June (Table 7; Figure 5), and used to estimate escapements from 28 June until the end of the season. Estimated travel times ranged from 2 to 5 d during the season. On the last day of the season, the best travel time estimate was 4 d.

Assuming travel time was 4 d, daily escapement estimates based on the catchability model ranged from 27% less to 1,012% greater than visual counts from towers (Table 5; Figure 3). Daily escapement estimates based on the 1985-1990 mean EPI value ranged from 26% less to 1,277% greater than visual counts from towers (Table 6; Figure 4). Daily escapement estimates based on travel time ranged from 64% less to 2% less than visual tower counts (Table 7; Figure 5). Accuracy increased towards the end of the season for estimates based on travel time. Estimates based on the 1985-1990 mean EPI value and

catchability were greater than tower counts from 19 to 26 June and less than tower counts for the remainder of the season.

When all methods were compared, estimates based on travel time were more accurate (MAPE=21) and less biased (MPE=-21) than those based on either catchability (MAPE=84; MPE=61) or the 1985-1990 mean EPI value (MAPE=96, MPE=80; Tables 5-7; Figures 3-5).

On 12 July, the last day of the project, estimated travel time was 4 d. The cumulative tower count on 16 July was 2,722,476 sockeye salmon. When compared to the observed tower count, the catchability estimate (2,015,968) was 26% lower, the 1985-1990 mean EPI value estimate (2,174,638) was 20% lower, and the travel time estimate (2,561,376) was 6% lower.

Mean water temperature during the project was 11°C; mean air temperature was 11°C (Appendix B.4). High winds and rough water prevented completion of one drift on 19 June and three drifts on 23 June.

### *Ugashik River*

Test fishing began 21 June and ended 15 July. A total of 1,739 sockeye salmon were caught, producing 27,359 daily index points (Table 8; Appendix C.1). A total of 1,155 sockeye salmon were sampled for sex, age, and length data; 424 were weighed (Appendix C.2). Weighted mean length and weight of captured sockeye salmon for the season were 534 mm and 2.6 kg (Table 8; Appendix C.3).

Sockeye salmon escapement estimates based on a catchability model, the 1985-1990 mean EPI<sub>a</sub> value (37), and travel time were used during the season to estimate spawning escapement (Tables 9-11; Figures 6-8). Abundance estimates, based on the 1985-1990 mean EPI value and the catchability model, were made as early as 21 June. Travel-time estimates were first available on 8 July. Estimated travel-times during the season ranged from 3 to 4 d. On the last day of the season, the best estimate of travel time was 4 d.

Assuming travel time was 4 d, escapement estimates from the catchability model ranged from 60% less to 4,973% greater than tower counts (Table 9; Figure 6). Estimates based on the 1985-1990 mean EPI value ranged from 59% less to 3,924% greater than tower counts (Table 10; Figure 7). Travel-time estimates ranged from 47% less to 8% greater than tower counts (Table 11; Figure 8). Catchability estimates and the 1985-1990 mean EPI value estimates were low most of the season.

When all methods were compared, estimates based on travel time were more accurate (MAPE=21) and less biased (MPE=-19) than the 1985-1990 mean EPI value (MAPE=967; MPE=899) and the catchability model (MAPE=1,127, MPE=1,060; Tables 9-11; Figures 6-8) estimates.

On the last day of the project, estimated travel time was 4 d. The cumulative tower count on 19 July was 2,255,216 sockeye salmon. When compared to the observed tower count, the 1985-1990 mean EPI value

estimate (1,012,266) was 55% lower, the catchability estimate (1,056,737) was 53% lower, and the travel-time estimate (2,443,480) was 8% greater.

Mean water temperature during the project was 12°C (Appendix C.4). Test-fishery project operations were not seriously hampered by weather conditions in 1991.

### *Igushik River*

Test fishing began 18 June and ended 15 July. A total of 822 sockeye salmon were caught, producing 7,432 daily index points (Table 12; Appendix D.1). A total of 653 sockeye salmon were sampled for sex, age, and length data; 199 were weighed (Appendix D.2). Weighted mean length and weight of captured sockeye salmon for the season were 557 mm and 3.1 kg (Table 12; Appendix D.3).

Sockeye salmon escapement estimates based on the 1988-1989 mean  $EPI_a$  value (26), and travel time ( $EPI_d$ ) were used during the season to estimate spawning escapement (Tables 13-14; Figures 9-10). The 1991 season was only the third season that drift gillnet gear was used; consequently there was insufficient data to estimate a catchability curve. An abundance estimate based on the 1988-1989 mean EPI value was made as early as 19 June. Travel-time estimates were first available on 28 June. Estimated travel-times during the season ranged from 2 to 4 d. On the last day of the season, the best estimate of travel time was 3 d.

Estimates based on the 1988-1989 mean EPI value ranged from 4% to 82% less than tower counts (Table 13; Figure 9). Travel-time estimates ranged from 26% less to 54% greater than tower counts (Table 14; Figure 10). Accuracy of travel-time analysis estimates increased during the season. The 1988-1989 mean EPI value estimates were low for the entire season.

When both methods were compared, estimates based on travel time were more accurate (MAPE=12) and less biased (MPE=2) than those based on the 1988-1989 mean EPI value (MAPE=68; MPE=-68; Tables 13-14; Figures 9-10).

On the last day of the project, estimated travel time was 3 d. The cumulative tower count on 18 July was 721,314 sockeye salmon. When compared to the observed tower count, the 1988-1989 mean EPI value estimate (193,217) was 73% lower and the travel time estimate (726,761) was 1% higher.

Mean water temperature during the project was 15°C; mean air temperature was 16°C (Appendix D.4). Test fish project operations were hampered by weather conditions on two occasions during 1991: high winds prevented completion of four drifts on 22 June and three drifts on 23 June.

## LITERATURE CITED

- Bucher, W. A. 1984. 1982 Igushik River escapement test fishing. Pages 70-81 *in* D. M. Eggers and S. M. Fried, editors. 1982 Bristol Bay salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 117, Juneau.
- Bucher, W. A., and M. Frederickson. 1985. 1983 Igushik River escapement test fishing. Pages 55-66 *in* S. M. Fried, editor. 1983 Bristol Bay Pacific salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 153, Juneau.
- Bue, B. G. 1982. 1981 Kvichak, Egegik, and Ugashik escapement test fishing. Pages 33-53 *in* H. J. Yuen, editor. 1981 Bristol Bay salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 72, Juneau.
- Bue, B. G. 1984. 1982 Kvichak, Egegik, and Ugashik escapement test fishing. Pages 51-69 *in* D. M. Eggers and S. M. Fried, editors. 1982 Bristol Bay salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 117, Juneau.
- Bue, B. G. 1986. Effects of gill net selectivity on sockeye salmon in the Egegik and Naknek-Kvichak Districts, Bristol Bay, Alaska. Master of Science Thesis, University of Alaska Fairbanks.
- Bue, B. G., and C. P. Meacham. 1981. 1980 Kvichak, Egegik, and Ugashik escapement test fishing. Pages 42-63 *in* H. J. Yuen, editor. 1980 Bristol Bay salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 65, Juneau.
- Bue, B. G., S. M. Fried, and W. A. Bucher. 1988. Bristol Bay sockeye salmon spawning escapement test fishing in 1985. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A88-4, Anchorage.
- Fried, S.M., and B.G. Bue. 1988a. Bristol Bay sockeye salmon spawning escapement test fishing in 1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A88-14, Anchorage.
- Fried, S.M., and B.G. Bue. 1988b. Bristol Bay sockeye salmon spawning escapement test fishing in 1988. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2K88-11, Anchorage.
- McBride, D. N. 1978. Igushik River inside test fishing, 1976-1978. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bristol Bay Data Report 67, Anchorage.

## LITERATURE CITED (continued)

- McBride, D. N. 1981. 1980 Igushik River escapement test fishing. Pages 64-73 *in* H. J. Yuen, editor. 1980 Bristol Bay salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 65, Juneau.
- McBride, D. N. and J. H. Clark. 1980. 1979 Igushik River inside test fishing. Pages 37-51 *in* H. J. Yuen, editor. 1979 Bristol Bay sockeye salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 56, Juneau.
- Meacham, C. P. 1980. 1979 Kvichak, Egegik, and Ugashik inside test fishing. Pages 18-36 *in* H. J. Yuen, editor. 1979 Bristol Bay sockeye salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 56, Juneau.
- Minard, R. E. 1982. 1981 Igushik River escapement test fishing. Pages 54-63 *in* H. J. Yuen, editor. 1981 Bristol Bay salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 72, Juneau.
- Paulus, R. D. 1965. Test fishing in Bristol Bay, 1960-64. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet 67, Juneau.
- Stratton, B.L. 1990. Bristol Bay sockeye salmon spawning escapement test fishing in 1990. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2K90-05, Anchorage.
- Stratton, B.L., S. M. Fried, and K. A. Rowell 1990. Bristol Bay sockeye salmon spawning escapement test fishing in 1989. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2K89-08, Anchorage.
- Yuen, H. J. 1985. 1983 Kvichak, Egegik, and Ugashik Escapement Test fishing. Pages 28-54 *in* S. M. Fried, editor. 1983 Bristol Bay Pacific salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 153, Juneau.
- Yuen, H. J., S. M. Fried, and W. A. Bucher. 1985. 1984 Bristol Bay sockeye salmon escapement test fishing. Pages 39-83 *in* S. M. Fried, editor. 1984 Bristol Bay Pacific salmon test fishing projects. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 154, Juneau.
- Yuen, H. J., S. M. Fried, and W. A. Bucher. 1988. Bristol Bay sockeye salmon spawning escapement test fishing in 1986. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A88-13, Anchorage.

Table 1. Sockeye salmon spawning escapement test-fishing data summary, Kvichak River, 1991.

Date	Fishing Time (min)	Catch (no)	Index	Cumulative Index	Daily Mean		Weighted Season Mean	
					Weight (kg)	Length (mm)	Weight	Length
6/19	28.0	0	0	0				
6/20	66.3	0	0	0				
6/21	35.0	0	0	0				
6/22	59.9	0	0	0				
6/23	62.3	2	7	7	1.9	517	1.9	517
6/24	63.3	3	11	18	2.5	525	2.3	521
6/25	51.4	3	20	39	2.4	531	2.3	526
6/26	57.5	3	12	51	2.1	530	2.3	527
6/27	47.4	84	669	720	2.7	528	2.6	527
6/28	40.5	118	1,545	2,265	2.4	534	2.5	531
6/29	8.2	164	4,743	7,008	2.4	551	2.4	544
6/30	7.0	163	6,020	13,029	2.4	531	2.4	538
7/01	7.7	161	6,052	19,081	2.3	521	2.4	532
7/02	8.6	177	5,261	24,342	2.3	541	2.4	534
7/03	15.6	133	3,598	27,940	2.4	530	2.4	534
7/04	13.8	148	3,133	31,073	2.3	534	2.4	534
7/05	52.0	39	190	31,263	2.6	518	2.4	534
7/06	41.4	31	206	31,469	2.4	510	2.4	533
7/07 <sup>a</sup>	16.0	100	2,052	33,521	2.4	525	2.4	533
7/08	5.3	102	5,056	38,578	2.4	526	2.4	533
7/09	6.3	165	6,240	44,818	2.2	515	2.4	530
7/10	6.3	154	6,217	51,035	2.3	525	2.4	529
7/11	21.5	128	1,500	52,534	2.4	522	2.3	529
7/12	43.3	111	800	53,334	2.4	526	2.3	529
7/13	37.1	140	1,024	54,358	2.5	528	2.3	529
7/14	38.9	98	671	55,029	2.4	523	2.3	529
7/15	31.0	111	895	55,924	2.2	522	2.3	529
7/16	23.9	50	493	56,417	2.4	510	2.3	529
7/17	30.4	32	252	56,669	2.3	504	2.3	529

<sup>a</sup> Includes interpolated data for two drifts

Table 2. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1985-1990: EPI=119) for test-fishing data and visual counts from observation towers, Kvichak River, 1991.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon	Date Plus Travel Time <sup>a</sup>	Cumulative Number of Sockeye Salmon	
6/19	0	6/21	b	
6/20	0	6/22	42	-100
6/21	0	6/23	72	-100
6/22	0	6/24	72	-100
6/23	879	6/25	132	566
6/24	2,172	6/26	726	199
6/25	4,595	6/27	3,570	29
6/26	6,062	6/28	49,530	- 88
6/27	85,720	6/29	124,740	- 31
6/28	269,557	6/30	277,338	- 3
6/29	833,988	7/01	588,168	42
6/30	1,550,397	7/02	901,086	72
7/01	2,270,622	7/03	1,255,590	81
7/02	2,896,639	7/04	1,581,414	83
7/03	3,324,823	7/05	1,924,986	73
7/04	3,697,667	7/06	2,140,704	73
7/05	3,720,302	7/07	2,207,526	69
7/06	3,744,840	7/08	2,276,616	64
7/07	3,958,822	7/09	2,354,562	68
7/08	4,560,529	7/10	2,633,160	73
7/09	5,303,089	7/11	3,079,986	72
7/10	6,042,917	7/12	3,459,846	75
7/11	6,221,358	7/13	3,639,354	71
7/12	6,316,555	7/14	3,723,066	70
7/13	6,438,363	7/15	3,820,722	69
7/14	6,518,230	7/16	3,907,560	67
7/15	6,624,778	7/17	3,997,434	66
7/16	6,683,415	7/18	4,061,862	65
7/17	6,713,400	7/19	4,114,932	63
Mean Percent Error (MPE)				63
Mean Absolute Percent Error (MAPE)				90

<sup>a</sup> Best travel-time estimate at end of season was 2 d.

<sup>b</sup> Observation towers not in operation.

Table 3. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Kvichak River, 1991.

Test Fishing				Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Travel Time (days)	EPI Value	Cumulative Number of Sockeye Salmon	Date Plus Travel Time	Cumulative Number of Sockeye Salmon	
6/28	1	68	155,752	6/29	124,740	25
6/29	1	55	385,935	6/30	277,338	39
6/30	1	39	515,575	7/01	588,168	-12
7/01	1	45	861,396	7/02	901,086	-4
7/02	1	47	1,149,517	7/03	1,255,590	-8
7/03	1	51	1,441,192	7/04	1,581,414	-9
7/04	2	64	2,018,733	7/06	2,140,704	-6
7/05	2	68	2,153,957	7/07	2,207,526	-2
7/06	2	68	2,168,014	7/08	2,276,616	-5
7/07	2	70	2,349,057	7/09	2,354,562	0
7/08	2	72	2,772,500	7/10	2,633,160	5
7/09	2	70	3,154,082	7/11	3,079,986	2
7/10	2	68	3,489,061	7/12	3,459,846	1
7/11	2	69	3,613,308	7/13	3,639,354	-1
7/12	2	68	3,616,515	7/14	3,723,066	-3
7/13	2	69	3,766,297	7/15	3,820,722	-1
7/14	2	70	3,841,936	7/16	3,907,560	-2
7/15	2	70	3,931,346	7/17	3,997,434	-2
7/16	2	71	4,006,585	7/18	4,061,862	-1
7/17	2	71	4,050,909	7/19	4,114,932	-2
Mean Percent Error (MPE)						1
Mean Absolute Percent Error (MAPE)						7

Table 4. Sockeye salmon spawning escapement test-fishing data summary, Egegik River, 1991.

Date	Fishing Time (min)	Catch (no)	Index	Cumulative Index	Daily Mean		Weighted Season Mean	
					Weight (kg)	Length (mm)	Weight	Length
6/15	78.8	2	4	4	2.1	485	2.1	485
6/16	73.5	15	44	48	2.7	550	2.6	544
6/17	82.2	21	57	105	2.6	557	2.6	551
6/18	81.4	46	146	252	2.6	540	2.6	544
6/19 <sup>a</sup>	83.9	55	170	421	2.4	533	2.5	539
6/20	81.9	82	239	660	2.4	535	2.5	537
6/21	75.4	46	130	790	2.3	523	2.4	535
6/22	37.3	25	159	949	2.3	527	2.4	534
6/23 <sup>a</sup>	30.0	36	303	1,251	2.4	546	2.4	534
6/24	50.9	98	489	1,740	2.4	526	2.4	531
6/25	57.3	101	818	2,558	2.3	525	2.4	529
6/26	72.6	42	133	2,691	2.3	509	2.4	528
6/27	63.0	101	476	3,167	2.2	520	2.3	526
6/28	27.6	192	1,742	4,909	2.6	533	2.4	528
6/29	19.3	166	2,564	7,474	2.3	529	2.4	529
6/30	7.5	143	6,114	13,588	2.6	536	2.5	531
7/01	11.8	114	3,171	16,759	2.7	551	2.5	534
7/02	7.7	162	5,421	22,180	2.5	537	2.5	534
7/03	15.5	151	4,213	26,393	2.4	540	2.5	535
7/04	29.0	90	1,048	27,441	2.2	512	2.5	534
7/05	46.0	20	104	27,545	2.8	513	2.5	534
7/06	31.3	82	704	28,249	2.6	536	2.5	534
7/07	35.0	36	241	28,490	2.4	527	2.5	534
7/08	17.2	49	710	29,200	2.3	524	2.5	534
7/09	39.9	77	465	29,664	2.2	509	2.4	534
7/10	39.4	29	176	29,840	2.0	469	2.5	533
7/11	29.2	90	932	30,773	2.1	519	2.5	533
7/12	34.4	36	294	31,066	1.9	513	2.5	533

<sup>a</sup> Includes interpolated data

Table 5. Comparison of sockeye salmon spawning escapement estimates based on catchability analysis of test-fishing data and visual counts from observation towers, Egegik River, 1991.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon <sup>a</sup>	Date Plus Travel Time <sup>b</sup>	Cumulative Number of Sockeye Salmon	
6/15	807	6/19	c	
6/16	2,489	6/20	c	
6/17	4,710	6/21	c	
6/18	12,919	6/22	c	
6/19	23,827	6/23	2,142	1,012
6/20	38,813	6/24	9,594	305
6/21	48,975	6/25	11,322	333
6/22	59,789	6/26	35,532	68
6/23	78,764	6/27	46,506	69
6/24	116,786	6/28	63,372	84
6/25	180,958	6/29	86,724	109
6/26	195,026	6/30	134,082	45
6/27	236,275	7/01	249,846	-5
6/28	349,284	7/02	406,296	-14
6/29	528,938	7/03	706,734	-25
6/30	916,724	7/04	1,011,972	-9
7/01	1,064,154	7/05	1,338,558	-20
7/02	1,394,438	7/06	1,684,146	-17
7/03	1,636,040	7/07	2,027,430	-19
7/04	1,728,477	7/08	2,169,624	-20
7/05	1,737,548	7/09	2,238,468	-22
7/06	1,780,586	7/10	2,275,836	-22
7/07	1,797,936	7/11	2,321,592	-23
7/08	1,846,859	7/12	2,407,488	-23
7/09	1,890,022	7/13	2,462,430	-23
7/10	1,914,418	7/14	2,613,498	-27
7/11	1,989,910	7/15	2,710,110	-27
7/12	2,015,968	7/16	2,722,476	-26
Mean Percent Error (MPE)				61
Mean Absolute Percent Error (MAPE)				84

<sup>a</sup> Catchability model was:  $EPI_m = (4.289 \times 10^{32}) M_i^{-11.302}$  where  $M_i$  = weighted mean length (Stratton 1990)

<sup>b</sup> Best travel-time estimate at end of season was 4 d.

<sup>c</sup> Observation towers not in operation.

Table 6. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1985-1990: EPI=70) for test-fishing data and visual counts from observation towers, Egegik River, 1991.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon	Date Plus Travel Time <sup>a</sup>	Cumulative Number of Sockeye Salmon	
6/15	297	6/19	b	
6/16	3 370	6/20	b	
6/17	7 383	6/21	b	
6/18	17,625	6/22	b	
6/19	29,492	6/23	2,142	1,277
6/20	46,200	6/24	9,594	382
6/21	55,287	6/25	11,322	388
6/22	66,414	6/26	35,532	87
6/23	87,592	6/27	46,506	88
6/24	121,817	6/28	63,372	92
6/25	179,092	6/29	86,724	107
6/26	188,377	6/30	134,082	40
6/27	221,684	7/01	249,846	-11
6/28	343,650	7/02	406,296	-15
6/29	523,160	7/03	706,734	-26
6/30	951,142	7/04	1,011,972	-6
7/01	1,173,104	7/05	1,338,558	-12
7/02	1,552,588	7/06	1,684,146	-8
7/03	1,847,512	7/07	2,027,430	-9
7/04	1,920,885	7/08	2,169,624	-11
7/05	1,928,132	7/09	2,238,468	-14
7/06	1,977,433	7/10	2,275,836	-13
7/07	1,994,315	7/11	2,321,592	-14
7/08	2,043,984	7/12	2,407,488	-15
7/09	2,076,511	7/13	2,462,430	-16
7/10	2,088,804	7/14	2,613,498	-20
7/11	2,154,078	7/15	2,710,110	-21
7/12	2,174,638	7/16	2,722,476	-20
Mean Percent Error (MPE)				80
Mean Absolute Percent Error (MAPE)				96

<sup>a</sup> Best travel-time estimate at end of season was 4 d.

<sup>b</sup> Observation towers not in operation

Table 7. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Egegik River, 1991.

Date	Test Fishing			Observation Towers		Percent Error (PE) of Test Fishing Estimate
	Travel Time (days)	EPI Value	Cumulative Number of Sockeye Salmon	Date Plus Travel Time	Cumulative Number of Sockeye Salmon	
6/28	3	24	121,601	7/01	249,846	-51
6/29	4	33	253,336	7/03	706,734	-64
6/30	5	52	712,096	7/05	1,338,558	-47
7/01	2	33	560,240	7/03	706,734	-21
7/02	2	29	663,213	7/04	1,011,972	-34
7/03	3	52	1,372,770	7/06	1,684,146	-18
7/04	3	60	1,657,040	7/07	2,027,430	-18
7/05	3	60	1,662,331	7/08	2,169,624	-23
7/06	4	75	2,144,990	7/10	2,275,836	-6
7/07	4	76	2,188,528	7/11	2,321,592	-6
7/08	4	79	2,308,664	7/12	2,407,488	-4
7/09	4	81	2,410,728	7/13	2,462,430	-2
7/10	4	80	2,404,014	7/14	2,613,498	-8
7/11	4	81	2,507,572	7/15	2,710,110	-7
7/12	4	82	2,561,376	7/16	2,722,476	-6
Mean Percent Error (MPE)						-21
Mean Absolute Percent Error (MAPE)						21

Table 8. Sockeye salmon spawning escapement test-fishing data summary, Ugashik River, 1991.

Date	Fishing Time (min)	Catch (no)	Index	Cumulative Index	Daily Mean		Weighted Season Mean	
					Weight (kg)	Length (mm)	Weight	Length
6/21	46.8	1	4	4	2.6	544	2.6	544
6/22	39.5	0	0	4			2.6	544
6/23	91.2	3	7	12	1.9	498	2.1	508
6/24	86.7	2	6	17	2.9	556	2.4	526
6/25	86.6	12	33	50	2.2	520	2.3	522
6/26	95.3	17	41	91	2.3	513	2.3	517
6/27	92.8	14	31	122	2.7	544	2.4	524
6/28	100.2	13	32	154	2.4	536	2.4	527
6/29	101.1	21	48	202	2.0	503	2.3	521
6/30	100.5	39	93	295	2.3	527	2.3	523
7/01	98.1	54	138	433	2.5	536	2.4	527
7/02	83.8	66	190	623	2.4	536	2.4	529
7/03	28.5	98	903	1,526	2.8	545	2.6	536
7/04	28.9	83	863	2,388	2.9	553	2.7	541
7/05	13.9	184	3,194	5,582	2.6	532	2.6	536
7/06	13.5	161	2,891	8,473	2.5	538	2.6	536
7/07	10.9	142	3,237	11,709	2.7	535	2.6	536
7/08	6.2	51	1,974	13,684			2.6	536
7/09	19.4	103	1,344	15,028	2.7	540	2.6	536
7/10	11.7	196	4,392	19,420	2.4	529	2.6	536
7/11	11.4	166	3,434	22,853	2.6	528	2.6	534
7/12	11.6	103	2,202	25,055	2.2	533	2.6	534
7/13	17.5	107	1,604	26,658	2.7	536	2.6	534
7/14	30.3	61	480	27,139	2.4	534	2.6	534
7/15	45.8	42	220	27,359	2.3	511	2.6	534

Table 9. Comparison of sockeye salmon spawning escapement estimates based on catchability analysis of test-fishing data and visual counts from observation towers, Ugashik River, 1991.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon <sup>a</sup>	Date Plus Travel Time <sup>b</sup>	Cumulative Number of Sockeye Salmon	
6/21	150	6/25	c	
6/22	150	6/26	c	
6/23	658	6/27	c	
6/24	749	6/28	c	
6/25	2,318	6/29	c	
6/26	4,468	6/30	c	
6/27	5,403	7/01	c	
6/28	6,603	7/02	c	
6/29	9,435	7/03	186	4,973
6/30	13,420	7/04	300	4,373
7/01	18,488	7/05	546	3,286
7/02	25,633	7/06	750	3,318
7/03	57,306	7/07	2,094	2,637
7/04	83,542	7/08	208,968	-60
7/05	209,061	7/09	412,884	-49
7/06	314,571	7/10	476,604	-34
7/07	437,098	7/11	496,956	-12
7/08	510,793	7/12	761,142	-33
7/09	557,506	7/13	1,331,346	-58
7/10	729,012	7/14	1,556,256	-53
7/11	879,709	7/15	2,041,100	-57
7/12	965,412	7/16	2,180,678	-56
7/13	1,026,347	7/17	2,211,974	-54
7/14	1,045,026	7/18	2,234,462	-53
7/15	1,056,737	7/19	2,255,216	-53
Mean Percent Error (MPE)				1,060
Mean Absolute Percent Error (MAPE)				1,127

<sup>a</sup> Catchability model was:  $EPI_m = (7.667 \times 10^{22}) M_i^{-7.808}$  where  $M_i$  = weighted mean length (Stratton 1990)

<sup>b</sup> Best travel-time estimate at end of season was 4 d.

<sup>c</sup> Observation towers not in operation.

Table 10. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1985-1990: EPI=37) for test-fishing data and visual counts from observation towers, Ugashik River, 1991.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon	Date Plus Travel Time <sup>a</sup>	Cumulative Number of Sockeye Salmon	
6/21	165	6/25	b	
6/22	165	6/26	b	
6/23	431	6/27	b	
6/24	639	6/28	b	
6/25	1,863	6/29	b	
6/26	3,364	6/30	b	
6/27	4,501	7/01	b	
6/28	5,702	7/02	b	
6/29	7,484	7/03	186	3,924
6/30	10,910	7/04	300	3,537
7/01	16,005	7/05	546	2,971
7/02	23,033	7/06	750	2,596
7/03	56,450	7/07	2,094	- 58
7/04	88,366	7/08	208,968	- 50
7/05	206,536	7/09	412,884	- 34
7/06	313,485	7/10	476,604	- 13
7/07	433,249	7/11	496,956	- 33
7/08	506,294	7/12	761,142	- 58
7/09	556,026	7/13	1,331,346	- 54
7/10	718,521	7/14	1,556,256	- 59
7/11	845,571	7/15	2,041,100	- 57
7/12	927,028	7/16	2,180,678	- 55
7/13	986,360	7/17	2,211,974	- 55
7/14	1,004,129	7/18	2,234,462	- 55
7/15	1,012,266	7/19	2,255,216	- 55
			Mean Percent Error (MPE)	899
			Mean Absolute Percent Error (MAPE)	967

<sup>a</sup> Best travel-time estimate at end of season was 4 d.

<sup>b</sup> Observation towers not in operation.

Table 11. Comparison of sockeye salmon spawning escapement estimates based on travel-time analysis of test-fishing data and visual counts from observation towers, Ugashik River, 1991.

Test Fishing				Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Travel Time (days)	EPI Value	Cumulative Number of Sockeye Salmon	Date Plus Travel Time	Cumulative Number of Sockeye Salmon	
7/08	3	37	512,255	7/11	496,956	3
7/09	4	73	1,111,544	7/13	1,331,346	-17
7/10	3	40	790,423	7/13	1,331,346	-41
7/11	3	36	829,975	7/14	1,556,256	-47
7/12	4	55	1,393,656	7/16	2,180,678	-36
7/13	3	68	1,827,623	7/16	2,180,678	-16
7/14	4	80	2,174,859	7/18	2,234,462	-3
7/15	4	89	2,443,480	7/19	2,255,216	8
Mean Percent Error (MPE)						-19
Mean Absolute Percent Error (MAPE)						21

Table 12. Sockeye salmon spawning escapement test-fishing data summary, Igushik River, 1991.

Date	Fishing Time (min)	Catch (no)	Index	Cumulative Index	Daily Mean		Weighted Season Mean	
					Weight (kg)	Length (mm)	Weight	Length
6/18	34.4	0	0	0				
6/19	70.9	1	2	2				
6/20	53.4	0	0	2				
6/21	72.7	0	0	2				
6/22	35.3	0	0	2				
6/23	40.9	9	84	86	2.7	539	2.7	539
6/24	39.8	35	527	614	3.1	547	3.1	546
6/25	49.7	43	321	935	2.6	556	3.0	549
6/26	45.2	21	179	1,113	2.8	570	3.0	553
6/27	68.1	2	8	1,121	3.7	613	3.0	553
6/28	68.7	8	27	1,148	3.1	555	3.0	553
6/29	73.6	22	55	1,204	3.2	540	3.0	553
6/30	67.7	65	258	1,462	3.2	577	3.0	557
7/01	48.8	66	545	2,006	3.2	554	3.1	556
7/02	41.4	77	940	2,946	3.2	563	3.1	558
7/03	25.8	92	1,333	4,279	3.1	561	3.1	559
7/04	23.9	108	1,183	5,462	3.1	561	3.1	559
7/05	50.1	29	137	5,598	3.2	552	3.1	559
7/06	35.8	68	540	6,138	2.8	570	3.1	560
7/07	20.5	18	231	6,370	3.1	535	3.1	559
7/08	56.1	14	61	6,431	3.0	556	3.1	559
7/09	42.8	14	82	6,512	3.0	555	3.1	559
7/10	46.4	26	139	6,651	3.1	552	3.1	559
7/11	34.7	44	300	6,951	3.2	543	3.1	558
7/12	46.7	10	53	7,004	2.6	534	3.1	558
7/13	39.0	39	370	7,374	3.0	532	3.1	557
7/14	39.8	8	43	7,417	3.3	546	3.1	557
7/15	43.8	3	15	7,432			3.1	557

Table 13. Comparison of sockeye salmon spawning escapement estimates based on mean EPI value (1988-89: EPI=26) for test-fishing data and visual counts from observation towers, Igushik River, 1991.

Test Fishing		Observation Towers		Percent Error (PE) of Test Fishing Estimate
Date	Cumulative Number of Sockeye Salmon	Date Plus Travel Time <sup>a</sup>	Cumulative Number of Sockeye Salmon	
6/18	0	6/21	<sup>b</sup>	
6/19	52	6/22	0	
6/20	52	6/23	0	
6/21	52	6/24	54	- 4
6/22	52	6/25	54	- 4
6/23	2,245	6/26	4,602	- 51
6/24	15,952	6/27	30,894	- 48
6/25	24,305	6/28	82,236	- 70
6/26	28,946	6/29	111,456	- 74
6/27	29,146	6/30	134,136	- 78
6/28	29,860	7/01	154,860	- 81
6/29	31,298	7/02	170,562	- 82
6/30	37,999	7/03	189,156	- 80
7/01	52,158	7/04	237,390	- 78
7/02	76,587	7/05	342,522	- 78
7/03	111,251	7/06	458,406	- 76
7/04	142,002	7/07	518,568	- 73
7/05	145,558	7/08	569,754	- 76
7/06	159,596	7/09	603,564	- 74
7/07	165,611	7/10	621,738	- 73
7/08	167,195	7/11	637,956	- 82
7/09	169,316	7/12	652,176	- 74
7/10	172,936	7/13	663,324	- 74
7/11	180,723	7/14	673,386	- 73
7/12	182,102	7/15	684,954	- 73
7/13	191,719	7/16	695,262	- 72
7/14	192,829	7/17	708,750	- 73
7/15	193,217	7/18	721,314	- 73
Mean Percent Error (MPE) - 68				
Mean Absolute Percent Error (MAPE) 68				

<sup>a</sup> Best travel-time estimate at end of season was 3 d.

<sup>b</sup> Observation towers not in operation.

Table 14. Comparison of sockeye salmon spawning escapement estimates based on travel time analysis of test-fishing data and visual counts from observation towers, Igushik River, 1991.

Date	Test Fishing			Observation Towers		Percent Error (PE) of Test Fishing Estimate
	Travel Time (days)	EPI Value	Cumulative Number of Sockeye Salmon	Date Plus Travel Time	Cumulative Number of Sockeye Salmon	
6/28	4	134	153,934	7/02	170,562	- 10
6/29	4	119	143,523	7/03	189,156	- 24
6/30	4	120	176,085	7/04	237,390	- 26
7/01	4	138	277,128	7/05	342,522	- 19
7/02	4	148	437,461	7/06	458,406	- 5
7/03	4	157	672,356	7/07	518,568	30
7/04	3	118	646,299	7/07	518,568	25
7/05	3	116	650,978	7/08	569,754	10
7/06	4	155	955,247	7/10	621,738	54
7/07	2	92	590,009	7/09	603,564	- 2
7/08	3	101	654,447	7/11	637,956	3
7/09	3	98	640,321	7/12	652,176	- 2
7/10	3	97	649,238	7/13	663,324	- 2
7/11	3	99	689,575	7/14	673,386	2
7/12	3	100	701,425	7/15	684,954	2
7/13	3	99	735,370	7/16	695,262	6
7/14	3	96	718,491	7/17	708,750	1
7/15	3	97	726,761	7/18	721,314	1
Mean Percent Error (MPE)						2
Mean Absolute Percent Error (MAPE)						12

1991 Kvichak River Sockeye Salmon Escapement  
Forecast vs. Observed Tower Count  
Based on 1985-1990 Mean EPI Value

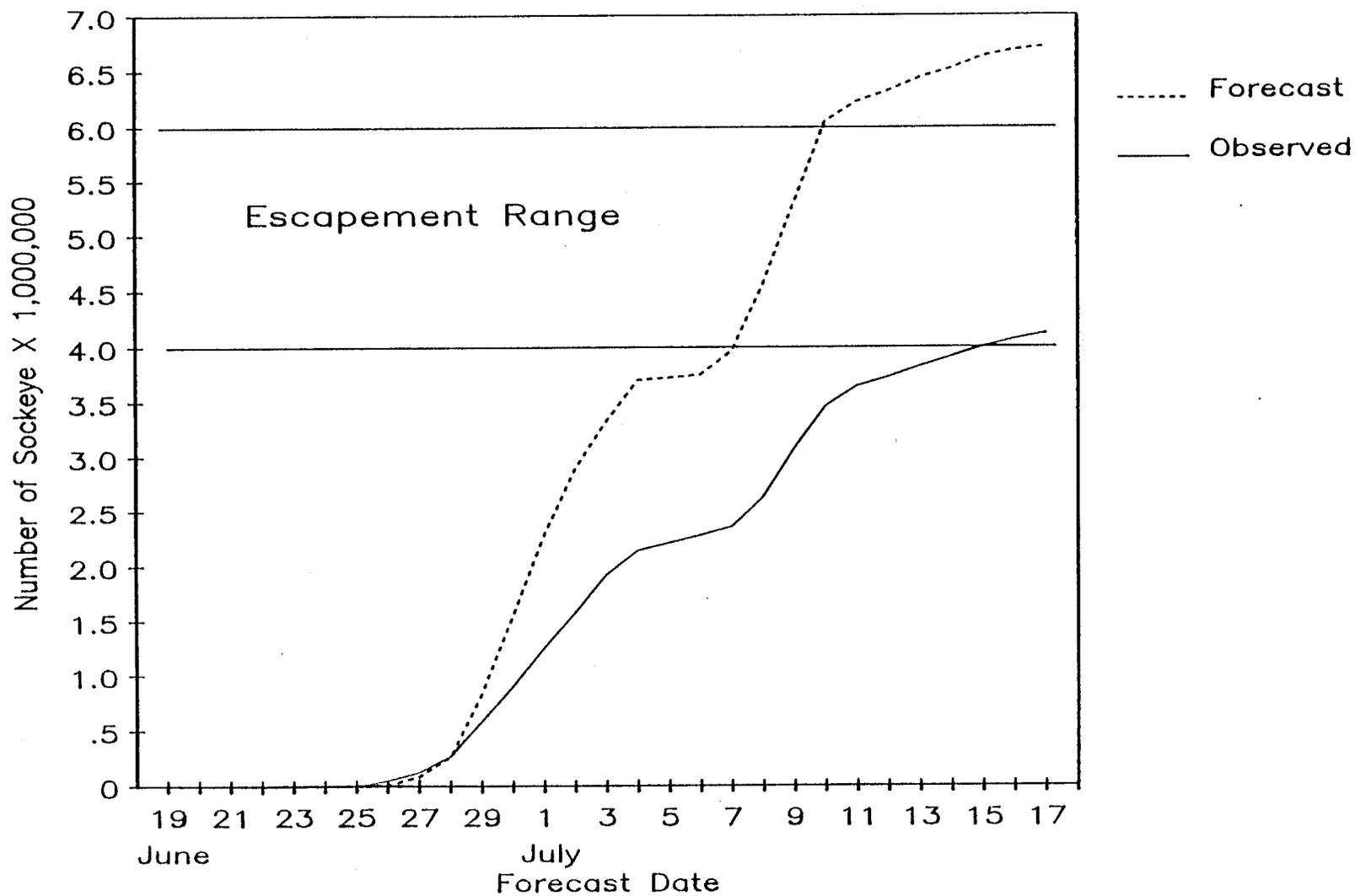


Figure 1. Comparison of 1985-1990 mean EPI value sockeye salmon escapement forecast and observed escapement, Kvichak River, 1991.

1991 Kvichak River Sockeye Salmon Escapement  
Forecast vs. Observed Tower Count  
Based on Travel Time Analysis

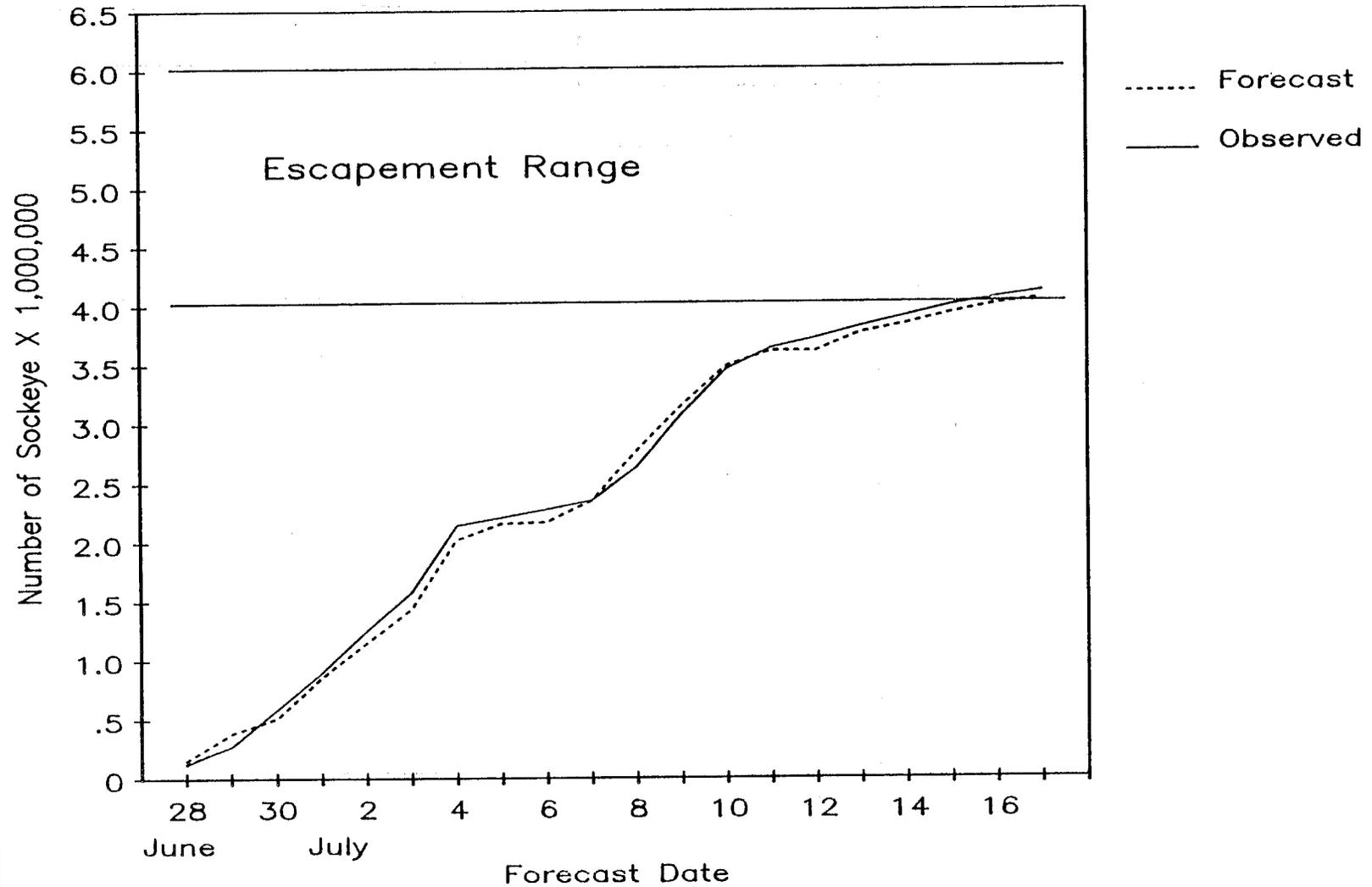


Figure 2. Comparison of travel time analysis sockeye salmon escapement forecast and observed escapement, Kvichak River, 1991.

1991 Egegik River Sockeye Salmon Escapement  
 Forecast vs. Observed Tower Count  
 Based on Catchability Analysis

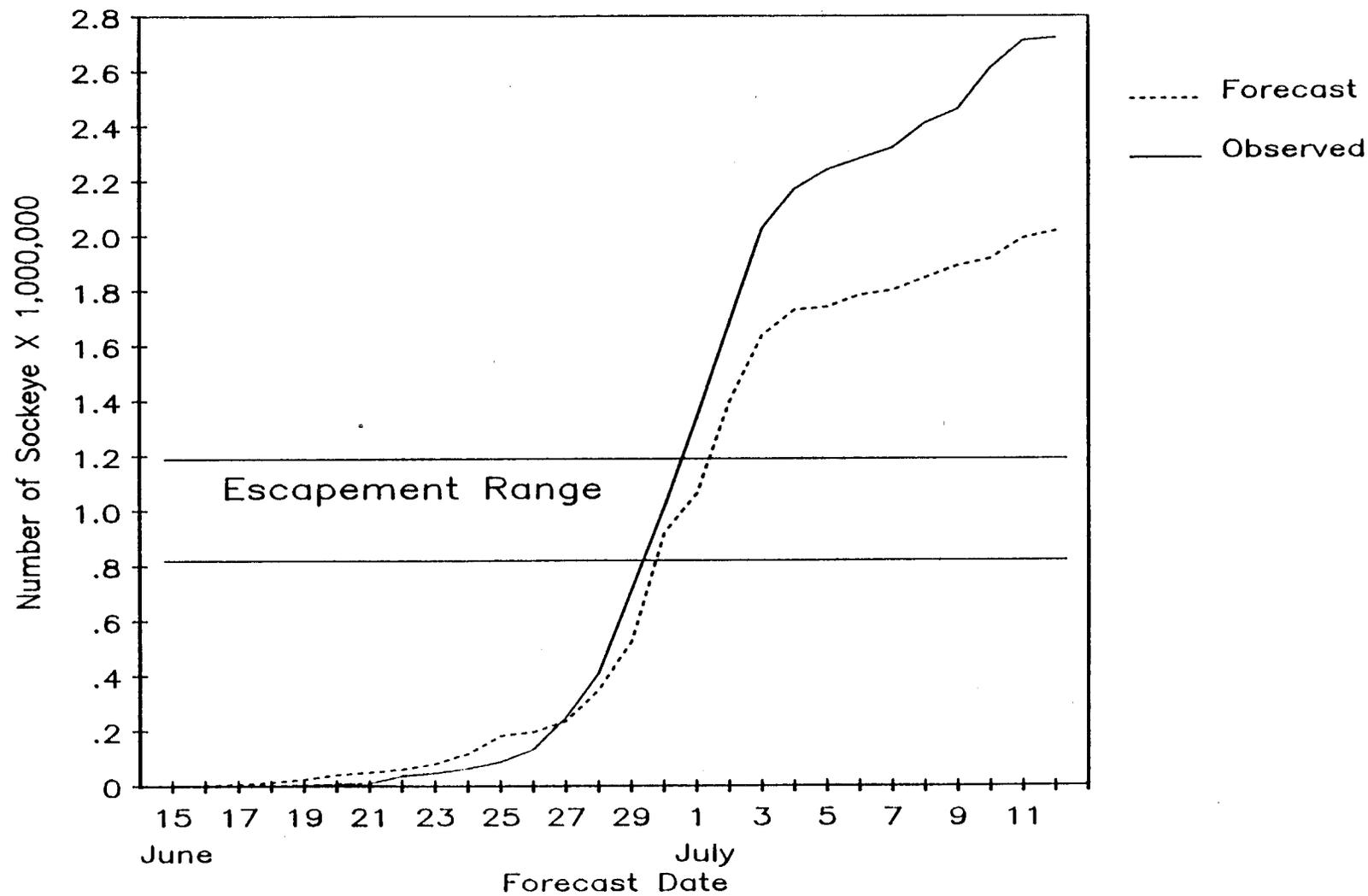


Figure 3. Comparison of catchability analysis sockeye salmon escapement forecast and observed escapement, Egegik River, 1991.

1991 Egegik River Sockeye Salmon Escapement  
 Forecast vs. Observed Tower Count  
 Based on 1985-1990 Mean EPI Value

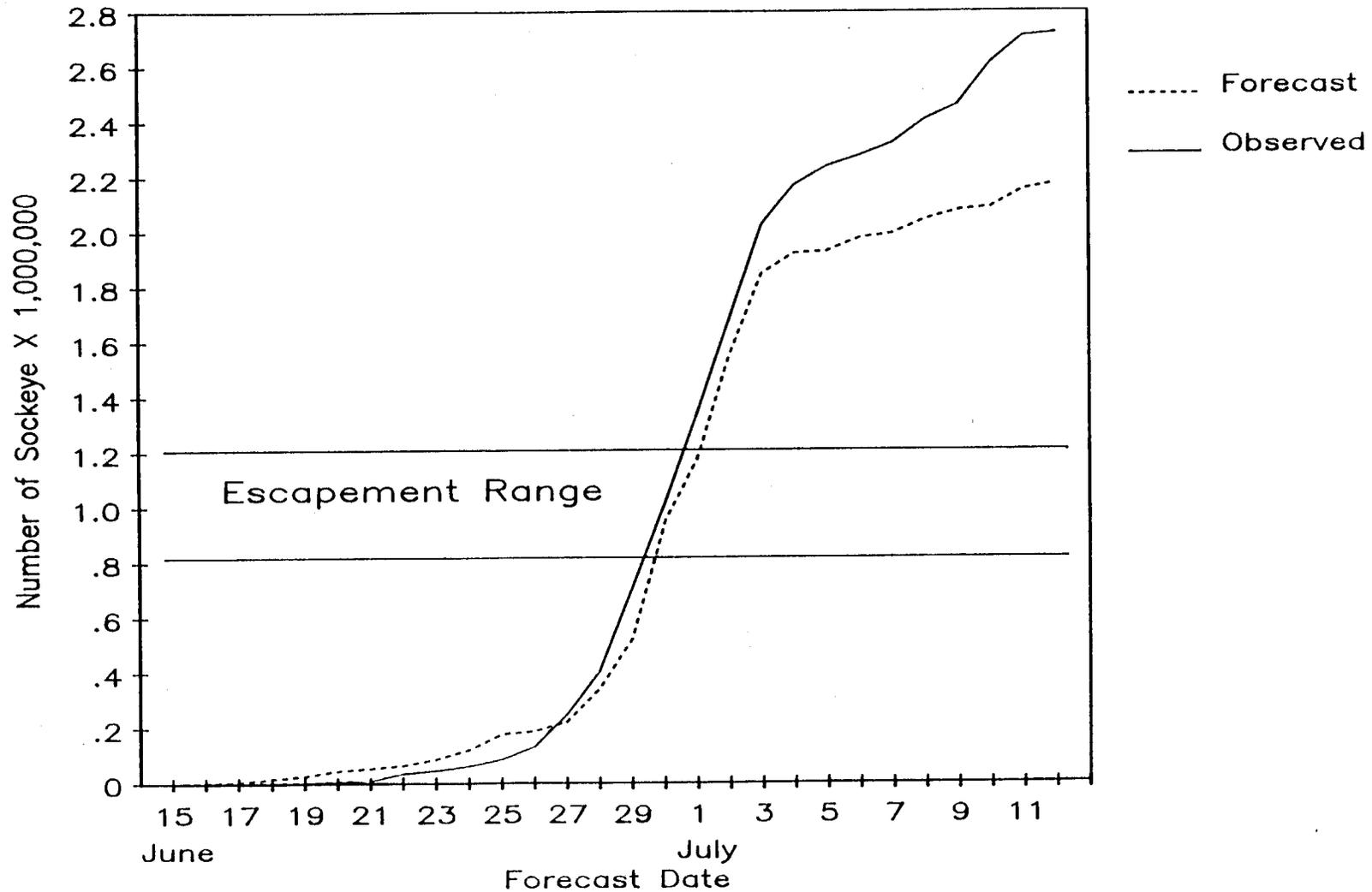


Figure 4. Comparison of 1985-1990 mean EPI value sockeye salmon escapement forecast and observed escapement, Egegik River, 1991.

1991 Egegik River Sockeye Salmon Escapement  
 Forecast vs. Observed Tower Count  
 Based on Travel Time Analysis

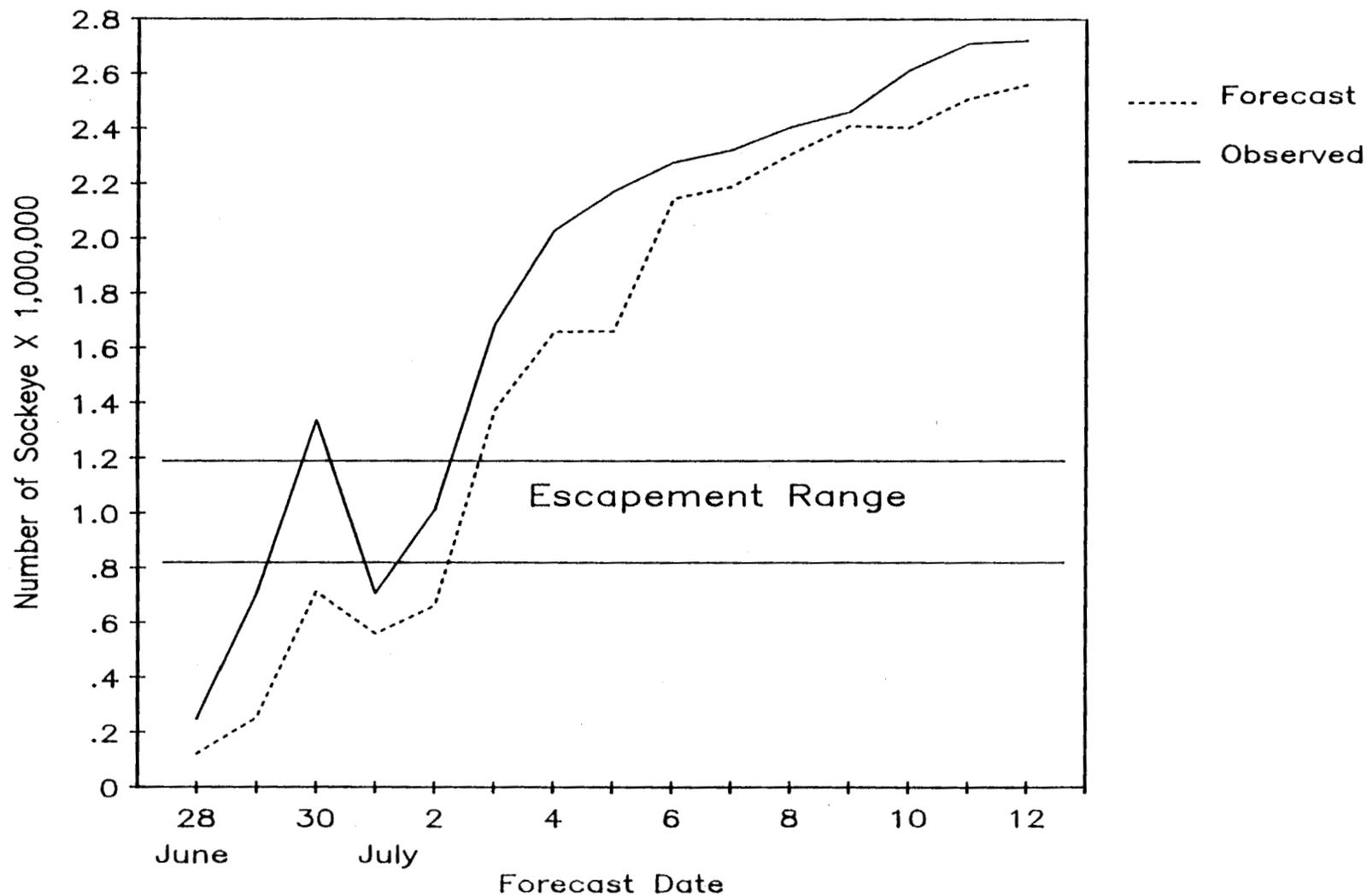


Figure 5. Comparison of travel time analysis sockeye salmon escapement forecast and observed escapement, Egegik River, 1991.

1991 Ugashik River Sockeye Salmon Escapement  
 Forecast vs. Observed Tower Count  
 Based on Catchability Analysis

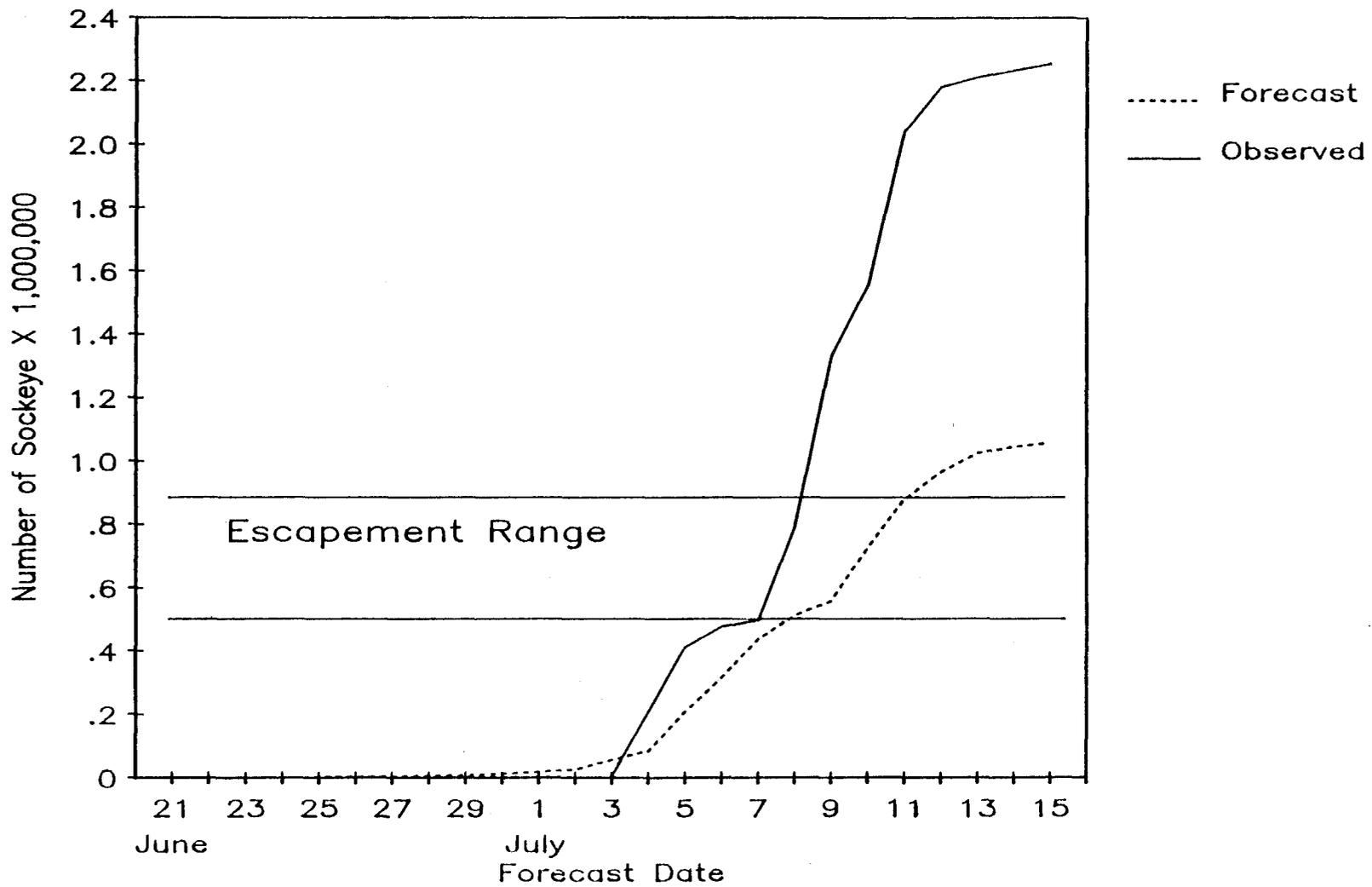


Figure 6. Comparison of catchability analysis sockeye salmon escapement forecast and observed escapement, Ugashik River, 1991.

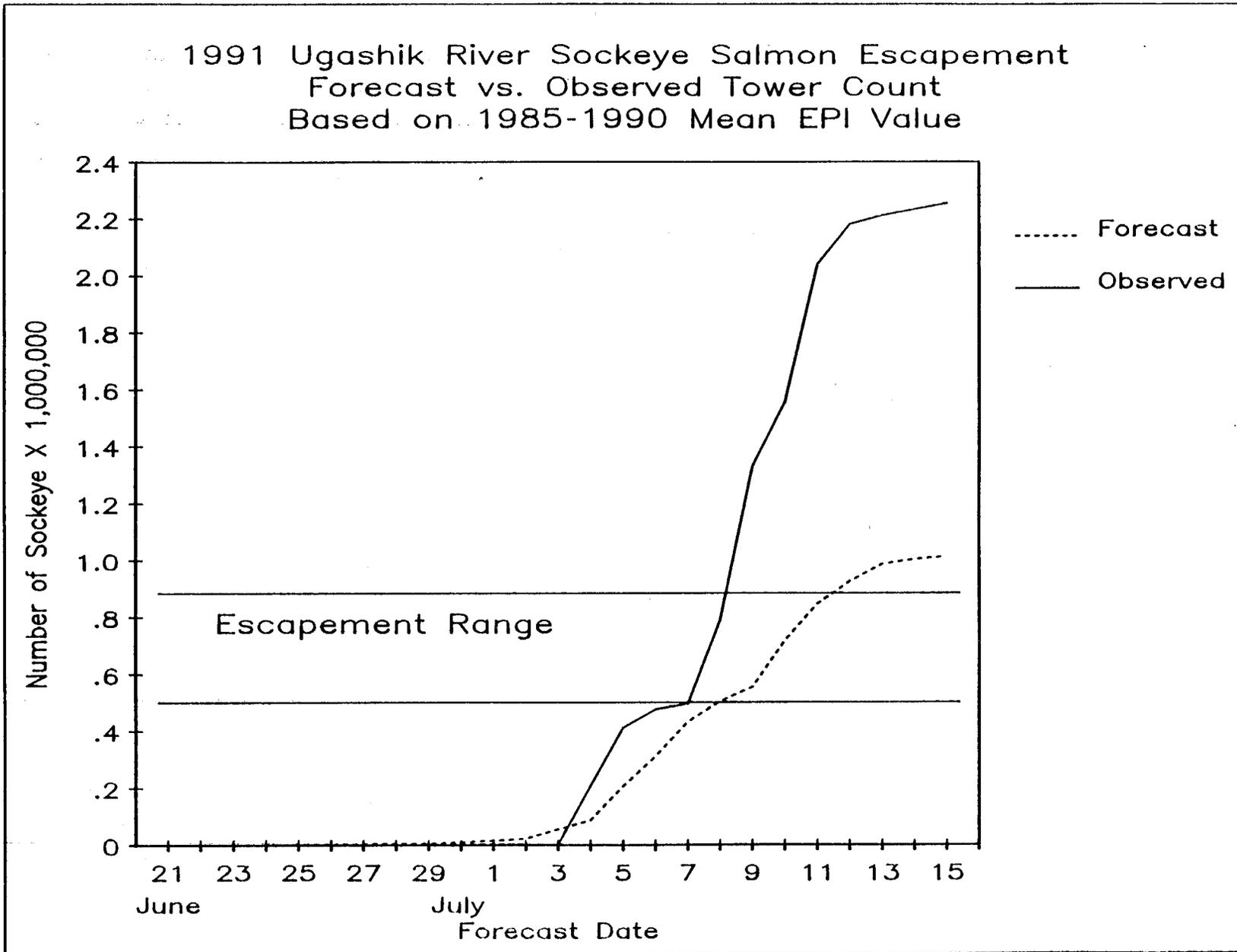


Figure 7. Comparison of 1985-1990 mean EPI value sockeye salmon escapement forecast and observed escapement, Ugashik River, 1991.

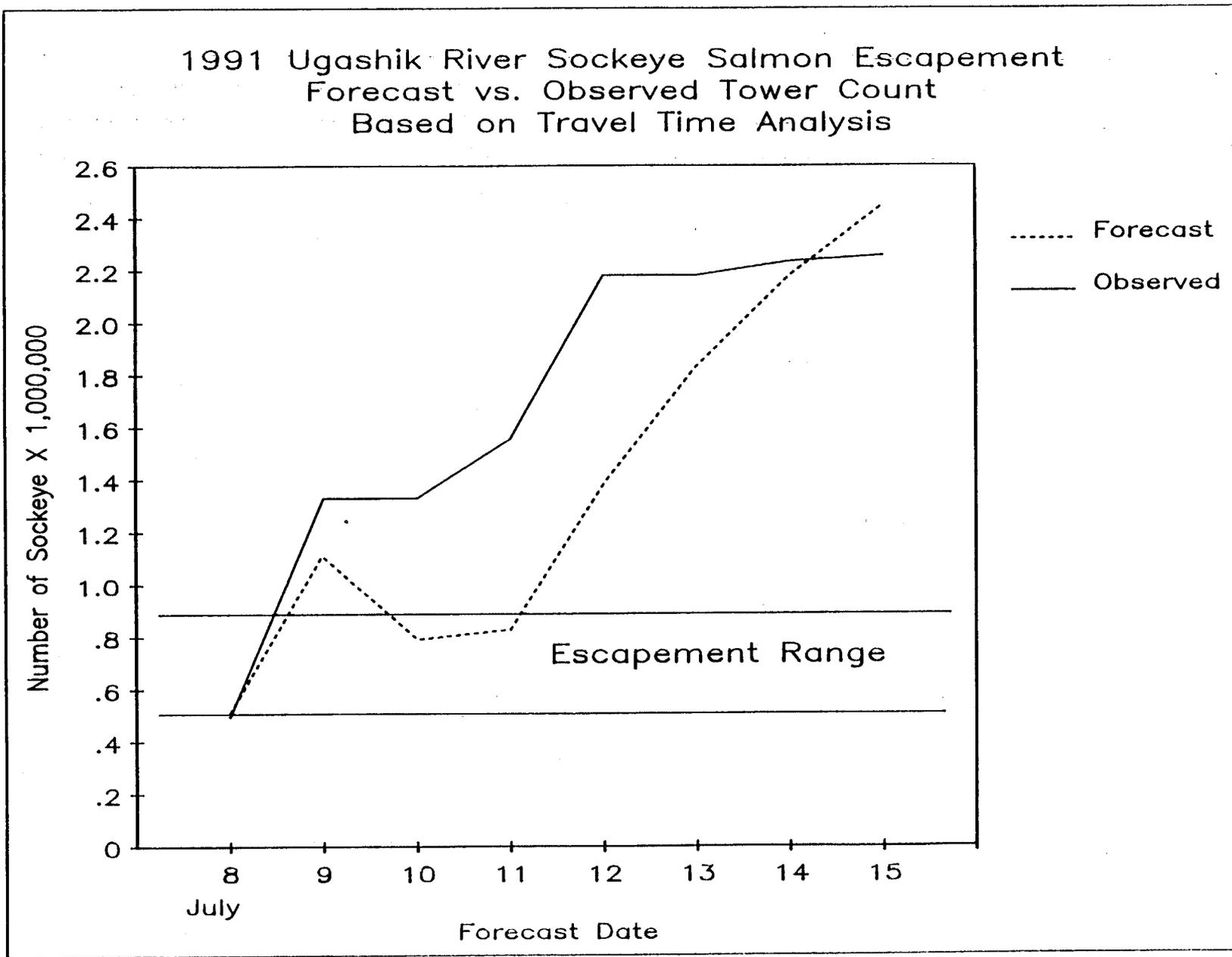


Figure 8. Comparison of travel time analysis sockeye salmon escapement forecast and observed escapement, Ugashik River, 1991.

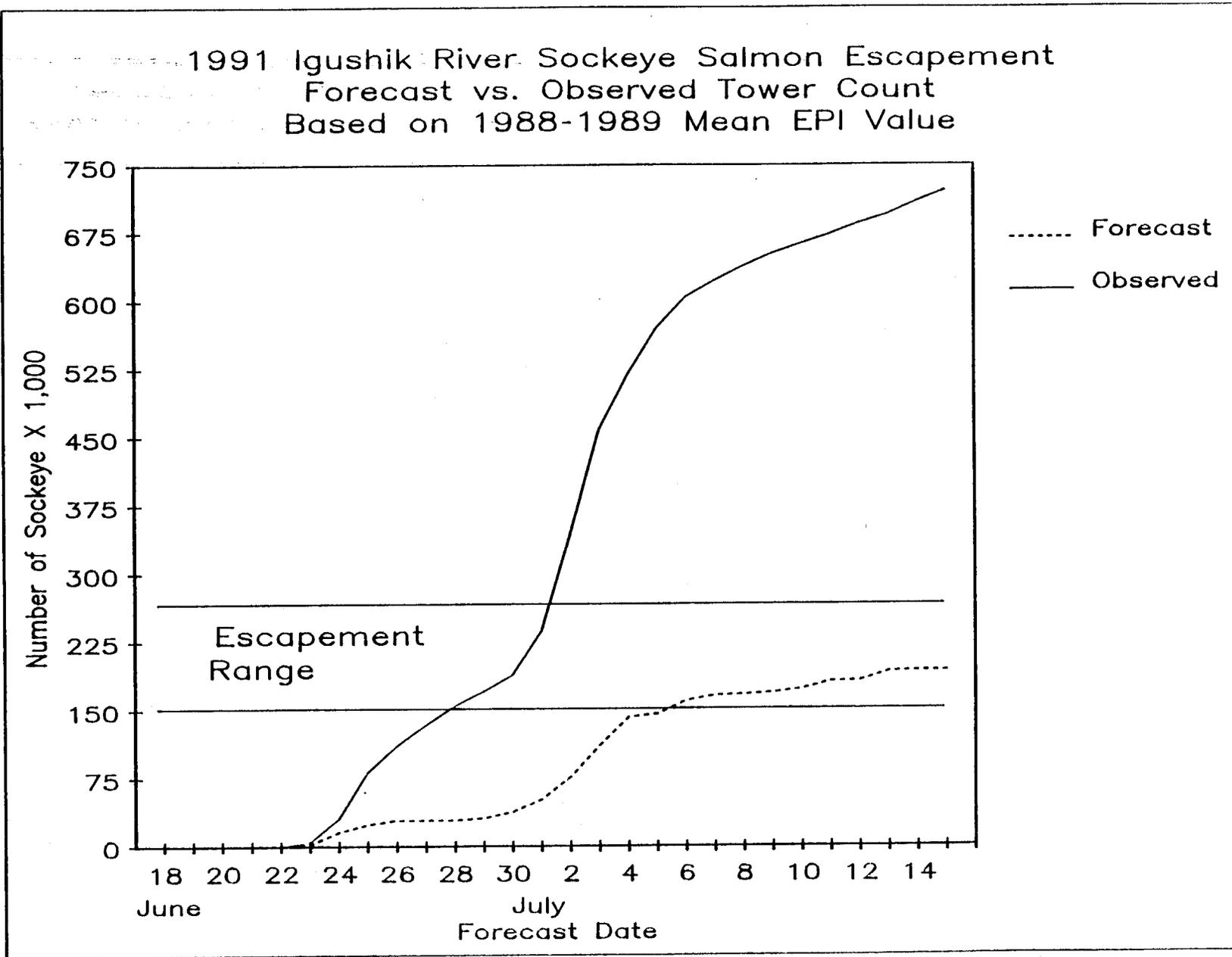


Figure 9. Comparison of 1988-1989 mean EPI value sockeye salmon escapement forecast and observed escapement, Igushik River, 1991.

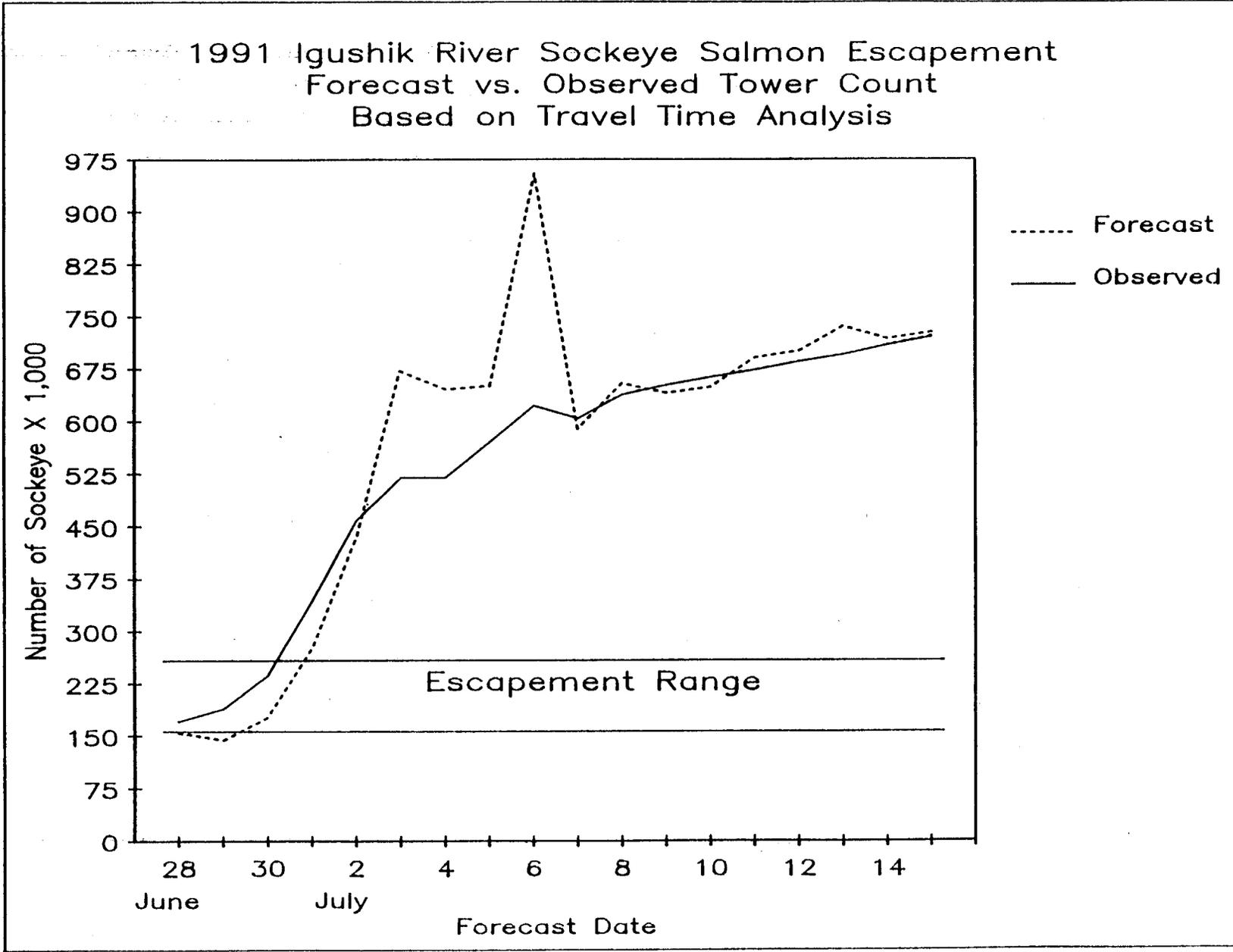


Figure 10. Comparison of travel time analysis sockeye salmon escapement forecast and observed escapement, Igushik River, 1991.



## **APPENDIX**



APPENDIX A: KVICHAK RIVER

A.1. Sockeye salmon test-fishing data, Kvichak River, 1991.

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/19	1	1	15.1	0	0.0		
6/19	2	2	12.9	0	0.0		
6/20	3	1	20.1	0	0.0		
6/20	4	2	14.5	0	0.0		
6/20	5	1	16.4	0	0.0		
6/20	6	2	15.3	0	0.0		
6/21	7	1	17.6	0	0.0		
6/21	8	2	17.4	0	0.0		
6/22	9	1	13.8	0	0.0		
6/22	10	2	15.4	0	0.0		
6/22	11	1	16.3	0	0.0		
6/22	12	2	14.4	0	0.0		
6/23	13	1	15.5	0	0.0		
6/23	14	2	13.9	0	0.0		
6/23	15	1	18.3	1	13.2	2.4	566
6/23	16	2	14.6	1	16.4	1.5	477
6/24	17	1	14.6	1	16.4	1.7	451
6/24	18	2	13.0	0	0.0		
6/24	19	1	19.1	1	12.5	2.5	532
6/24	20	2	16.6	1	14.4	3.4	602
6/25	21	1	15.0	0	0.0		
6/25	22	2	13.8	0	0.0		
6/25	23	1	7.3	2	66.2	2.1	513
6/25	24	2	15.3	1	15.7	3.6	609
6/26	25	1	14.5	0	0.0		
6/26	26	2	14.3	0	0.0		
6/26	27	1	14.6	3	49.2	2.1	530
6/26	28	2	14.1	0	0.0		
6/27	29	1	14.3	11	185.3	2.1	494
6/27	30	2	14.1	2	34.0		558
6/27	31	1	14.9	40	645.4	2.7	530
6/27	32	2	4.1	31	1,803.6	2.7	530
6/28	33	1	15.4	5	78.0	2.4	554
6/28	34	2	14.4	4	66.8	2.7	567
6/28	35	1	7.3	44	1,456.6	2.4	534
6/28	36	2	3.4	65	4,622.2	2.4	533
6/29	37	1	1.9	18	2,304.0	1.5	518
6/29	38	2	1.9	30	3,840.0	2.2	524

-Continued-

APPENDIX A: KVICHAK RIVER (p 2 of 6)

A.1. (p 2 of 3).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/29	39	1	2.3	35	3,733.3	2.7	555
6/29	40	2	2.1	81	9,148.2	2.6	568
6/30	41	1	2.3	23	2,453.3	2.0	523
6/30	42	2	1.9	44	5,632.0	2.3	500
6/30	43	1	1.5	65	10,400.0	2.5	550
6/30	44	2	1.3	31	5,952.0	2.4	530
7/01	45	1	3.5	32	2,194.3	2.2	526
7/01	46	2	1.4	60	10,472.7	2.3	528
7/01	47	1	1.5	41	6,560.0	2.5	532
7/01	48	2	1.3	28	5,376.0	2.1	492
7/02	49	1	3.3	49	3,618.5	2.2	531
7/02	50	2	1.9	41	5,248.0	2.5	562
7/02	51	1	1.6	42	6,203.1	2.3	539
7/02	52	2	1.8	45	6,171.4	2.2	532
7/03	53	1	2.8	18	1,570.9	1.9	522
7/03	54	2	9.4	29	742.4	2.5	536
7/03	55	1	1.9	49	6,272.0	2.2	530
7/03	56	2	1.5	37	5,920.0	2.6	531
7/04	57	1	3.1	29	2,227.2	2.3	528
7/04	58	2	1.9	37	4,736.0	2.4	551
7/04	59	1	6.3	39	1,497.6	2.2	532
7/04	60	2	2.5	43	4,128.0	2.1	519
7/05	61	1	14.4	4	66.8	2.4	541
7/05	62	2	7.1	9	303.2	3.2	540
7/05	63	1	16.6	21	303.2	1.7	500
7/05	64	2	13.9	5	86.5	3.9	486
7/06	65	1	7.1	14	471.6	2.2	506
7/06	66	2	6.8	3	106.7	2.9	523
7/06	67	1	14.0	5	85.7	3.6	518
7/06	68	2	13.5	9	160.0	1.9	509
7/07	69	1	7.6	6	188.9	2.4	508
7/07	70	2	3.4	42	2,986.7	2.4	526
7/07 <sup>a</sup>		1	2.6	19	1,739.4		
7/07 <sup>a</sup>		2	2.4	33	3,309.0		
7/08	71	1	3.3	45	3,323.1	2.2	521
7/08	72	2	2.0	57	6,840.0	2.5	528

-Continued-

APPENDIX A: KVICHAK RIVER (p 3 of 6)

A.1. (p 3 of 3).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/09	73	1	1.5	21	3,360.0	2.3	506
7/09	74	2	1.6	22	3,249.2	2.1	476
7/09	75	1	1.6	50	7,384.6		524
7/09	76	2	1.6	72	10,633.8		524
7/10	77	1	1.8	35	4,800.0	2.2	521
7/10	78	2	1.6	31	4,578.5	2.5	530
7/10	79	1	1.8	43	5,897.1	2.3	524
7/10	80	2	1.1	45	9,600.0	2.2	526
7/11	81	1	4.1	28	1,629.1	2.4	519
7/11	82	2	3.6	28	1,853.8	2.5	519
7/11	83	1	7.8	42	1,300.6	2.3	523
7/11	84	2	6.0	30	1,200.0	2.4	531
7/12	85	1	4.5	25	1,333.3	2.4	526
7/12	86	2	14.6	20	328.2	2.2	524
7/12	87	1	15.8	26	396.2		
7/12	88	2	8.4	40	1,146.3		
7/13	89	1	12.6	32	608.3	2.2	520
7/13	90	2	10.6	20	451.8	3.0	539
7/13	91	1	7.0	58	1,988.6		
7/13	92	2	6.9	30	1,047.3		
7/14	93	1	10.8	16	357.2	2.3	509
7/14	94	2	6.1	30	1,175.5	2.4	527
7/14	95	1	13.0	29	535.4		
7/14	96	2	9.0	23	613.3		
7/15	97	1	7.1	34	1,145.3	2.2	517
7/15	98	2	7.3	30	993.1	2.1	516
7/15	99	1	6.5	25	923.1	2.2	531
7/15	100	2	10.1	22	521.5	2.4	529
7/16	101	1	9.8	18	443.1	2.5	507
7/16 <sup>b</sup>	102	2	14.1	32	543.7	2.3	513
7/17	103	1	15.6	18	276.5	2.2	506
7/17	104	2	14.8	14	227.8	2.4	501

<sup>a</sup> Interpolated to account for missed fishing time

<sup>b</sup> Two drifts missed due to high winds and rough water

APPENDIX A: KVICHAK RIVER (p 4 of 6)

A.2. Age, sex, and size composition of sockeye salmon caught in the Kvichak River test fishery, 1991.

	Age Group							Total
	0.3	1.2	2.1	1.3	2.2	1.4	2.3	
<b>All Periods Combined</b>								
	<u>MALES</u>							
Percent	0.05	25.74		16.26	8.00		9.27	59.32
Sample Size	1	486		307	151		175	1,120
Mean Length	544	504		570	513		578	535
Std. Error		1		2	2		3	1
Sample Size	1	485		301	149		170	1,106
Mean Weight		2.10		3.06	2.24		2.94	2.51
Std. Error		0.04		0.08	0.08		0.13	0.04
Sample Size		98		44	30		26	198
	<u>FEMALES</u>							
Percent	0.21	17.74	0.05	10.65	5.51	0.05	6.46	40.68
Sample Size	4	335	1	201	104	1	122	768
Mean Length	536	493	399	545	500	511	554	518
Std. Error	7	1		2	2		2	1
Sample Size	4	332	1	195	103	1	119	755
Mean Weight		1.80	0.84	2.48	1.95		2.72	2.15
Std. Error		0.04		0.07	0.10		0.11	0.03
Sample Size		64	1	39	17		22	143
	<u>ALL FISH</u>							
Percent	0.26	43.48	0.05	26.91	13.51	0.05	15.73	100.00
Sample Size	5	821	1	508	255	1	297	1,888
Mean Length	538	499	399	560	508	511	568	528
Std. Error	7	1		1	2		2	1
Sample Size	5	817	1	496	252	1	289	1,861
Mean Weight		1.98	0.84	2.83	2.12		2.85	2.36
Std. Error		0.03		0.05	0.06		0.09	0.02
Sample Size		162	1	83	47		48	341

## A.3. Kvichak River sockeye salmon test-fishing data, 1979-1991.

Year	Weighted Season Mean		Travel Time (days)	Indices		Spawning Escapement		EPI	Test Fishing Data Reference
	Weight	Length		Cumulative Number	Last Date Fished	Cumulative Number	Date <sup>a</sup>		
1979 <sup>b</sup>	2.5	520	2	21,901	6/29	5,330,532	7/01	243	Meacham (1980)
1980	2.2	514	2	106,315	7/09	18,508,524	7/11	174	Bue and Meacham (1981)
1981	2.6	529	2	20,813	7/01	1,723,506	7/13	83	Bue (1982)
1982	2.6	532	2	17,718	7/21	1,119,996	7/23	63	Bue (1984)
1983	2.3	514	2	13,234	7/12	2,853,198	7/14	216	Yuen (1985)
1984	2.3	519	3	45,584	7/12	10,111,152	7/15	222	Yuen et al. (1985)
1985 <sup>c</sup>	2.5	538	5	41,649	7/16	7,120,506	7/23	171	Bue et al. (1988)
1986	2.5	530	1	25,923	7/15	1,102,242	7/16	43	Yuen et al. (1988)
1987	2.1	509	2	55,881	7/14	5,945,994	7/16	106	Fried and Bue (1988a)
1988	2.7	548	1	38,743	7/17	4,045,500	7/18	104	Fried and Bue (1988b)
1989	2.4	516	2	58,044	7/16	8,163,918	7/18	141	Stratton et al. (1990)
1990	2.3	510	3	44,794	7/15	6,673,872	7/18	149	Stratton (1990)
Mean	2.4	523	2					143	
1991	2.3	529	2	56,669	7/17	4,114,932	7/19	71	Current Report

<sup>a</sup> Cumulative spawning escapement date is last date fished at test fishing site plus travel time to counting tower site.

<sup>b</sup> Two sites used from 1979-1984: station 1 on west bank above Nakeen; station 2 on east bank about 2 km above Sea Gull Flat Island.

<sup>c</sup> Data from 1985 to present may not be comparable with those from 1979-1984. Test fishing sites were relocated in 1985 about 20 km upriver from old sites, and gillnets with smaller stretched mesh size (12.70 cm instead of 13.65 cm) and different web material (multistrand monofilament instead of multifilament nylon) were used.

APPENDIX A: KVICHAK RIVER (p 6 of 6)

Appendix A.4. Climatological and hydrological observations made at Kvichak River sockeye salmon test-fishing site, 1991.

Date	Cloud Cover <sup>a</sup>		Wind Velocity (km/hr)		Air Temp. (°C)		Water Temp. (°C)		Precipitation <sup>b</sup>	Water Clarity
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.		
6 19	-	3	0- 5 W	0- 5 W	10	12	9	9	A	lt. brown
6 20	-	3	0- 3 W	0- 3 W	10	11	9	9	A	lt. brown
6 21	3	3	0- 3 W	0- 5 SE	10	15	9	11	0	lt. brown
6 22	2	2	0- 5 SE	0- 5 SE	11	15	9	12	A	lt. brown
6 23	3	3	0- 5 E	5-10 E	10	12	9	11	A	lt. brown
6 24	3	3	0- 5 E	0- 5 E	10	12	10	11	B	lt. brown
6 25	3	3	0- 5 SE	0- 5 SE	10	15	10	11	0	lt. brown
6 26	4	4	0- 5 SE	0- 5 SE	14	12	11	13	A	lt. brown
6 27	4	4	0- 5 SE	0- 5 SE	10	14	10	11	A	lt. brown
6 28	5	4	5-10 SE	5-10 SW	9	14	11	11	A	lt. brown
6 29	5	3	5-10 SE	0- 5 SE	8	14	11	12	A	lt. brown
6 30	5	4	0- 5 SE	0- 5 SE	8	13	11	11	A	lt. brown
7 1	5	3	0- 5 SE	0- 5 SE	8	14	11	11	A	lt. brown
7 2	5	3	0- 5 SE	0- 5 SE	8	13	11	11	0	lt. brown
7 3	5	3	0- 5 SE	0- 5 SE	8	14	11	11	0	lt. brown
7 4	3	3	0- 3 SE	0- 3 SE	9	14	11	11	0	lt. brown
7 5	3	3	0- 3 SE	0- 3 SE	14	14	11	11	A	lt. brown
7 6	4	3	0- 3 SE	0- 3 SE	10	15	12	12	0	lt. brown
7 7	3	3	0- 3 N	20+ SE	16	14	11	11	A	lt. brown
7 8	3	4	0- 5 SE	5-20 SE	16	14	11	11	0	lt. brown
7 9	5	5	5-10 SE	0- 5 NE	9	12	11	11	A	lt. brown
7 10	4	1	0- 5 SE	5-10 SW	14	19	11	12	0	lt. brown
7 11	5	4	0- 5 SE	0- 5 SW	12	16	11	11	0	lt. brown
7 12	5	2	0- 5 SE	0- 5	10	16	12	12	0	lt. brown
7 13	4	4	5-10 SW	5-10 E	10	14	11	11	A	lt. brown
7 14	3	3	0- 5 SE	0- 5 SW	10	16	11	12	0	lt. brown
7 15	3	4	5-10 SE	15-20 SW	10	13	11	11	A	lt. brown
7 16	4	4	10-15 SE	20+ SW	9	12	11	11	A	lt. brown
7 17	4	-	10-15 SE	-	9	-	11	-	A	lt. brown

<sup>a</sup> 1 = cloud cover not more than 1/10, 2 = cloud cover not more than 1/2, 3 = cloud cover more than 1/2, 4 = completely overcast, and 5 = fog

<sup>b</sup> 0 = none; A = intermittent rain; B = continuous rain

APPENDIX B: EGEK RIVER

B.1. Sockeye salmon test-fishing data, Egegik River, 1991.

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/15	1	1	7.8	0	0.0		
6/15	2	2	17.0	0	0.0		
6/15	3	1	6.7	0	0.0		
6/15	4	2	6.2	0	0.0		
6/15	5	1	5.8	0	0.0		
6/15	6	2	14.1	2	34.0	2.1	485
6/15	7	1	9.9	0	0.0		
6/15	8	2	11.3	0	0.0		
6/16	9	1	8.9	0	0.0		
6/16	10	2	9.6	0	0.0		
6/16	11	1	7.6	0	0.0		
6/16	12	2	7.3	2	66.1	3.4	593
6/16	13	1	7.0	0	0.0		
6/16	14	2	9.9	5	120.8	2.5	544
6/16	15	1	11.4	2	42.2	2.5	554
6/16	16	2	11.8	6	121.9	2.5	531
6/17	17	1	8.2	0	0.0		
6/17	18	2	9.8	1	24.4	3.4	588
6/17	19	1	9.7	0	0.0		
6/17	20	2	12.8	4	75.0	2.5	545
6/17	21	1	10.4	0	0.0		
6/17	22	2	11.6	6	123.8	2.1	534
6/17	23	1	9.2	2	52.4	2.8	602
6/17	24	2	10.5	8	183.0	2.7	561
6/18	25	1	10.4	0	0.0		
6/18	26	2	8.4	0	0.0		
6/18	27	1	8.7	1	27.7	2.1	515
6/18	28	2	14.4	4	66.6	3.7	519
6/18	29	1	11.4	1	21.1	1.6	472
6/18	30	2	9.4	20	510.6	2.5	548
6/18	31	1	10.0	2	48.1	3.6	509
6/18	32	2	8.7	18	497.0	2.5	541
6/19	33	1	10.3	2	46.4	1.9	507
6/19	34	2	11.0	14	305.5	2.3	530
6/19 <sup>a</sup>		1	10.2	1	23.6		
6/19	35	2	7.6	15	471.6	2.3	535
6/19	36	1	9.8	0	0.0		
6/19	37	2	13.1	5	91.4	2.6	547
6/19	38	1	11.5	0	0.0		

-Continued-

APPENDIX B: EGEGIK RIVER (p 2 of 7)

B.1. (p 2 of 4).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/19	39	2	10.4	18	415.1	2.5	532
6/20	40	1	9.2	7	182.6	2.3	522
6/20	41	2	9.1	18	476.0	2.1	530
6/20	42	1	9.1	0	0.0		
6/20	43	2	9.7	22	543.4	2.2	538
6/20	44	1	8.9	0	0.0		
6/20	45	2	13.6	5	88.5	2.3	542
6/20	46	1	10.6	2	45.5	2.6	552
6/20	47	2	11.7	28	576.8	2.8	537
6/21	48	1	7.7	6	188.0	2.5	540
6/21	49	2	12.7	9	170.1	2.2	535
6/21	50	1	12.7	19	360.2	2.6	525
6/21	51	2	11.7	5	102.9	2.0	517
6/21	52	1	7.0	1	34.2	2.2	498
6/21	53	2	7.2	1	33.4	2.3	481
6/21	54	1	9.2	2	52.5	2.1	489
6/21	55	2	7.2	3	99.7	1.5	507
6/22	56	1	9.6	3	75.1	2.7	543
6/22	57	2	7.9	3	90.9	1.7	482
6/22	58	1	9.3	12	310.8	2.2	534
6/22	59	2	10.5	7	160.0	2.6	532
6/23 <sup>a</sup>		1	9.0	5	132.8		
6/23 <sup>a</sup>		2	6.9	15	519.0		
6/23	60	1	7.2	1	33.3	2.4	546
6/23 <sup>a</sup>		2	6.9	15	519.0		
6/24	61	1	8.6	4	111.8	2.4	526
6/24	62	2	7.3	39	1,276.4	2.7	530
6/24	63	1	6.6	1	36.2	1.9	459
6/24	64	2	4.4	10	548.6	1.9	534
6/24	65	1	5.2	31	1,444.7	2.4	516
6/24	66	2	6.9	7	245.0	2.1	520
6/24	67	1	5.0	4	193.0	2.6	573
6/24	68	2	6.9	2	70.1	2.7	540
6/25	69	1	7.2	5	166.5	2.4	495
6/25	70	2	2.8	31	2,625.9	2.2	518
6/25	71	1	7.3	0	0.0		
6/25	72	2	4.2	32	1,825.0	2.2	522
6/25	73	1	11.5	3	62.3	2.3	537
6/25	74	2	3.2	22	1,641.5	2.4	541
6/25	75	1	10.4	2	46.0	2.2	509

-Continued-

APPENDIX B: EGEGIK RIVER (p 3 of 7)

B.1. (p 3 of 4).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/25	76	2	10.7	6	134.8	3.0	552
6/26	77	1	11.0	0	0.0		
6/26	78	2	5.1	2	93.7	2.3	463
6/26	79	1	4.7	2	102.7	2.4	547
6/26	80	2	12.2	10	197.3	2.2	522
6/26	81	1	10.3	9	209.5	2.4	509
6/26	82	2	10.3	11	255.5	2.2	508
6/26	83	1	9.7	4	99.5	2.3	498
6/26	84	2	9.3	4	103.4	2.4	506
6/27	85	1	10.9	3	65.8	2.1	512
6/27	86	2	6.2	6	232.3	2.2	518
6/27	87	1	9.4	3	76.9	1.9	485
6/27	88	2	10.3	5	117.0	3.0	539
6/27	89	1	8.5	8	225.4	3.0	527
6/27	90	2	5.9	21	861.5	2.2	514
6/27	91	1	6.6	31	1,124.4	2.1	525
6/27	92	2	5.2	24	1,098.9	2.2	520
6/28	93	1	4.2	20	1,136.1	2.3	528
6/28	94	2	3.9	21	1,289.6	2.8	545
6/28	95	1	3.2	12	900.0	2.6	519
6/28	96	2	3.2	31	2,295.1	2.2	524
6/28	97	1	3.5	37	2,537.1	2.3	527
6/28	98	2	4.4	17	932.6	2.4	527
6/28	99	1	2.3	16	1,669.6	2.3	533
6/28	100	2	2.9	38	3,144.8	3.2	545
6/29	101	1	2.7	38	3,430.7	2.3	527
6/29	102	2	2.1	64	7,402.4	2.3	530
6/29	103	1	2.4	5	501.7	2.3	532
6/29	104	2	7.2	28	929.0	2.4	504
6/29	105	1	1.5	12	1,986.2	2.1	529
6/29	106	2	3.4	19	1,347.8	2.7	554
6/30	107	1	1.4	31	5,410.9	2.8	525
6/30	108	2	1.5	55	8,849.2	2.4	526
6/30	109	1	1.1	43	9,526.2	2.6	551
6/30	110	2	3.5	14	953.2	2.6	547
7/01	111	1	1.3	34	6,044.4	3.1	560
7/01	112	2	1.4	18	3,180.4	2.5	555
7/01	113	1	4.8	24	1,189.7	2.1	525
7/01	114	2	4.3	38	2,141.7	2.3	536
7/02	115	1	1.4	36	6,134.9	2.6	541
7/02	116	2	2.0	64	7,523.3	2.6	552

-Continued-

APPENDIX B: EGEGIK RIVER (p 4 of 7)

B.1. (p 4 of 4).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/02	117	1	1.6	38	5,555.3	2.3	514
7/02	118	2	2.7	24	2,113.8	2.5	530
7/03	119	1	1.4	49	8,657.7	2.2	539
7/03	120	2	2.0	55	6,740.4	2.6	545
7/03	121	1	5.9	17	689.6	2.6	514
7/03	122	2	6.2	30	1,153.5	2.3	532
7/04	123	1	10.7	10	224.8	2.4	512
7/04	124	2	9.2	23	600.0	2.2	504
7/04	125	1	3.4	34	2,429.8	1.9	509
7/04	126	2	5.7	23	961.4	2.8	523
7/05	127	1	10.0	3	72.0	2.6	533
7/05	128	2	17.1	8	112.3	2.7	508
7/05	129	1	9.3	6	154.3	2.7	496
7/05	130	2	9.6	3	74.9	3.1	534
7/06	131	1	7.9	22	667.7	2.5	521
7/06	132	2	6.4	39	1,460.6	2.8	542
7/06	133	1	10.1	4	95.0	2.8	536
7/06	134	2	6.9	17	587.8	2.3	540
7/07	135	1	10.4	12	276.5	2.2	521
7/07	136	2	9.8	11	269.2	2.7	550
7/07	137	1	7.1	5	169.0	1.9	500
7/07	138	2	7.7	8	248.0	2.5	526
7/08	139	1	9.2	13	338.5	2.6	535
7/08	140	2	8.0	36	1,082.3	2.2	521
7/09	141	1	9.1	14	369.9	2.2	487
7/09	142	2	10.3	13	302.4	2.2	507
7/09	143	1	10.6	16	361.7	2.2	504
7/09	144	2	9.9	34	820.8	2.3	521
7/10	145	1	9.4	3	76.3	1.6	493
7/10	146	2	9.0	13	345.1	2.2	447
7/10	147	1	8.9	3	80.9	1.5	478
7/10	148	2	12.1	10	198.2	2.0	495
7/11	149	1	7.8	10	307.0	2.0	518
7/11	150	2	5.1	36	1,699.7	2.0	518
7/11	151	1	10.5	5	114.1	2.9	524
7/11	152	2	5.8	39	1,620.8	2.2	521
7/12	153	1	11.9	0	0.0		
7/12	154	2	9.3	7	181.6	1.6	519
7/12	155	1	7.4	23	744.3	1.8	507
7/12	156	2	5.8	6	247.2	2.3	527

<sup>a</sup> Interpolated to account for missed fishing time

APPENDIX B: EGEGIK RIVER (p 5 of 7)

B.2. Age, sex, and size composition of sockeye salmon caught in the Egegik River test fishery, 1991.

	Age Group							Total
	1.2	2.1	1.3	2.2	2.3	3.2	3.3	
<u>All Periods Combined</u>								
	<u>MALES</u>							
Percent	7.63		18.52	24.08	6.69	0.12	0.18	57.22
Sample Size	129		313	407	113	2	3	967
Mean Length	499		568	511	565	537	579	534
Std. Error	3		2	2	4	10	19	1
Sample Size	127		306	393	107	2	3	938
Mean Weight	2.02		3.02	2.18	2.96	2.19	2.80	2.52
Std. Error	0.06		0.05	0.04	0.11		0.20	0.03
Sample Size	48		90	112	31	1	2	284
	<u>FEMALES</u>							
Percent	4.62	0.06	17.81	15.33	4.97			42.78
Sample Size	78	1	301	259	84			723
Mean Length	491	542	543	497	545			521
Std. Error	3		1	2	3			1
Sample Size	76	1	292	251	82			702
Mean Weight	1.73		2.49	1.89	2.61			2.21
Std. Error	0.07		0.05	0.04	0.07			0.03
Sample Size	23		82	79	27			211
	<u>ALL FISH</u>							
Percent	12.25	0.06	36.33	39.41	11.66	0.12	0.18	100.00
Sample Size	207	1	614	666	197	2	3	1,690
Mean Length	496	542	556	505	557	537	579	529
Std. Error	2		1	1	2	10	19	1
Sample Size	203	1	598	644	189	2	3	1,640
Mean Weight	1.91		2.76	2.07	2.81	2.19	2.80	2.39
Std. Error	0.05		0.04	0.03	0.07		0.20	0.02
Sample Size	71		172	191	58	1	2	495

APPENDIX B: EGEKIK RIVER (p 6 of 7)

B.3. Test-fishing data, 1979-1990, to estimate constants for 1991 Egegik River catchability model.

Year <sup>a</sup>	Weighted Season Mean		Travel Time (days)	Indices		Spawning Escapement		EPI	Test Fishing Data Reference
	Weight	Length		Cumulative Number	Last Date Fished	Cumulative Number	Date <sup>b</sup>		
1979	2.7	548	1	23,980	7/10	905,034	7/11	38	Meacham (1980)
1980	2.3	525	4	13,312	7/16	1,060,860	7/20	80	Bue and Meacham (1981)
1981	2.6	544	3	18,921	7/13	691,764	7/16	37	Bue (1982)
1982	3.0	569	3	30,361	7/12	1,029,684	7/15	34	Bue (1984)
1983	2.6	537	1	16,276	7/10	718,368	7/11	44	Yuen (1985)
1984	2.6	543	3	26,947	7/12	1,151,028	7/15	43	Yuen et al. (1985)
1985 <sup>c</sup>	2.4	529	4	19,974	7/09	1,052,250	7/13	53	Bue et al. (1988)
1986	2.5	541	1	16,370	7/14	981,841	7/15	60	Yuen et al. (1988)
1987	2.7	551	2	21,810	7/14	1,162,464	7/16	53	Fried and Bue (1988a)
1988	2.8	553	1	21,024	7/16	1,591,752	7/17	76	Fried and Bue (1988b)
1989	2.7	551	3	30,343	7/12	1,590,234	7/15	52	Stratton et al. (1990)
1990	2.4	525	3	17,578	7/16	2,155,062	7/19	123	Stratton (1990)
Mean	2.6	543	2					58	
1991 <sup>d</sup>	2.5	533	4	31,066	7/12	2,722,476	7/16	88	Current Report

<sup>a</sup> Two sites located about 3 km upriver from tip of Egg Island used: station 1 on south bank and station 2 on north bank.

<sup>b</sup> Cumulative spawning escapement date is last date fished at test fishing site plus travel time to counting tower site.

<sup>c</sup> Data from 1985 to present may not be comparable with those from 1979-1984 because gillnets with a smaller stretched mesh size (13.02 cm instead of 13.65 cm) and different web material (multi-strand monofilament instead of multifilament nylon) were used.

<sup>d</sup> Catchability model for 1992:  $EPI_m = (5.845 \times 10^{34}) M_1^{-12.080}$  where  $M_1$  = weighted mean length.

APPENDIX B: EGEGIK RIVER (p 7 of 7)

Appendix B.4. Climatological and hydrological observations made at Egegik River sockeye salmon test-fishing site, 1991.

Date	Cloud Cover <sup>a</sup>		Wind Velocity (km/hr)		Air Temp. (°C)		Water Temp. (°C)		Precipitation <sup>b</sup>	Clarity
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.		
6 15	4	4	5 S	15 S	-	-	-	-	0	murky
6 16	4	4	5 S	15 S	-	-	-	-	A	murky
6 17	4	3	15-20 S	15-20 S	-	-	-	-	A	murky
6 18	1	4	calm	5-15 ESE	-	-	-	-	B	murky
6 19	3	1	25-30 ESE	10-20 ESE	8	9	-	-	A	murky
6 20	1	1	5-15 ESE	calm	-	-	-	10	0	murky
6 21	1	3	calm	5 ESE	10	10	-	9	0	murky
6 22	2	2	10-15	5 ESE	10	10	-	11	0	clear
6 23	4	4	35	35 NE	5	10	-	-	0	lt. brown
6 24	4	4	0- 5 NE	0- 5 NE	8	-	-	-	B	brown
6 25	4	4	calm	calm	9	8	-	-	B	brown
6 26	4	4	calm	0- 5 NE	8	9	-	-	A	brown
6 27	4	-	0- 5 NE	0- 5 NE	8	9	-	-	A	brown
6 28	2	4	calm	5-10 S	8	15	-	-	B	lt. brown
6 29	3	2	calm	calm	9	20	-	-	0	lt. brown
6 30	2	1	calm	0- 5 SE	9	10	-	10	0	lt. brown
7 1	2	1	0- 5 SE	0- 5 SE	9	15	-	9	0	lt. brown
7 2	5	2	5-10 SE	5-10 SE	10	16	-	10	0	lt. brown
7 3	5	1	0- 5 SE	calm	14	15	-	12	0	lt. brown
7 4	1	1	0- 5 SE	calm	12	15	13	12	0	lt. brown
7 5	4	4	0- 5 SE	0- 5 SE	10	12	12	11	A	lt. brown
7 6	5	2	calm	calm	12	11	10	11	A	lt. brown
7 7	2	4	calm	calm	14	15	9	10	B	lt. brown
7 8	5	1	calm	0- 5 SE	12	10	10	12	0	lt. brown
7 9	5	5	10-25 SE	0- 5 S	10	14	12	11	A	lt. brown
7 10	5	5	calm	15-20 S	16	14	-	-	0	lt. brown
7 11	4	4	5-10 S	calm	14	12	-	9	0	lt. brown
7 12	1	1	10-15 SE	0- 5	15	14	-	-	0	lt. brown

<sup>a</sup> 1 = cloud cover not more than 1/10, 2 = cloud cover not more than 1/2, 3 = cloud cover more than 1/2, 4 = completely overcast, and 5 = fog

<sup>b</sup> 0 = none; A = intermittent rain; B = continuous rain

APPENDIX C: UGASHIK RIVER

C.1. Sockeye salmon test-fishing data, Ugashik River, 1991.

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/21	1	1	14.9	0	0.0		
6/21	2	2	10.4	0	0.0		
6/21	3	1	13.4	1	18.0	2.6	544
6/21	4	2	8.1	0	0.0		
6/22	5	1	11.4	0	0.0		
6/22	6	2	12.5	0	0.0		
6/22	7	1	8.4	0	0.0		
6/22	8	2	7.2	0	0.0		
6/23	9	1	11.2	0	0.0		
6/23	10	2	9.6	0	0.0		
6/23	11	1	11.0	0	0.0		
6/23	12	2	11.0	0	0.0		
6/23	13	1	12.1	0	0.0		
6/23	14	2	9.7	1	24.7	1.2	434
6/23	15	1	11.9	0	0.0		
6/23	16	2	14.7	2	32.6	2.5	546
6/24	17	1	10.5	0	0.0		
6/24	18	2	11.0	0	0.0		
6/24	19	1	7.8	0	0.0		
6/24	20	2	10.3	1	23.3	3.3	579
6/24	21	1	11.8	0	0.0		
6/24	22	2	13.0	0	0.0		
6/24	23	1	11.3	0	0.0		
6/24	24	2	11.0	1	21.8	2.5	531
6/25	25	1	9.9	0	0.0		
6/25	26	2	8.6	2	55.5	2.2	543
6/25	27	1	9.8	1	24.5	1.9	514
6/25	28	2	8.2	1	29.2	2.0	511
6/25	29	1	12.2	1	19.7	2.3	518
6/25	30	2	12.0	4	80.0	2.3	518
6/25	31	1	12.9	0	0.0		
6/25	32	2	13.0	3	55.4	2.2	510
6/26	33	1	9.6	1	24.9	2.3	525
6/26	34	2	9.1	1	26.5	1.2	401
6/26	35	1	14.1	1	17.0	3.0	554
6/26	36	2	13.3	3	54.2	2.6	526
6/26	37	1	13.0	3	55.2	2.1	515
6/26	38	2	10.8	3	66.5	2.3	522
6/26	39	1	15.0	5	79.9	2.5	519
6/26	40	2	10.4	0	0.0		

-Continued-

APPENDIX C: UGASHIK RIVER (p 2 of 8)

C.1. (p 2 of 4).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/27	41	1	10.1	0	0.0		
6/27	42	2	8.3	0	0.0		
6/27	43	1	10.1	1	23.9	3.0	523
6/27	44	2	10.2	0	0.0		
6/27	45	1	14.4	3	50.1	2.8	558
6/27	46	2	15.2	3	47.5	2.5	537
6/27	47	1	14.2	6	101.4	2.6	538
6/27	48	2	10.3	1	23.4	3.2	578
6/28	49	1	13.4	1	17.9	2.0	484
6/28	50	2	11.5	1	20.8	3.5	582
6/28	51	1	11.8	1	20.4	1.8	508
6/28	52	2	13.3	2	36.0	3.0	560
6/28	53	1	13.3	0	0.0		
6/28	54	2	13.3	0	0.0		
6/28	55	1	11.4	5	105.4	2.4	534
6/28	56	2	12.2	3	58.9	1.8	534
6/29	57	1	13.8	3	52.2	1.9	501
6/29	58	2	11.0	4	87.4	1.7	471
6/29	59	1	11.0	1	21.7	1.8	492
6/29	60	2	13.0	1	18.4	2.4	541
6/29	61	1	14.1	3	51.0	1.7	503
6/29	62	2	14.8	7	113.7	2.2	514
6/29	63	1	11.7	0	0.0		
6/29	64	2	11.7	2	41.1	2.0	536
6/30	65	1	13.9	4	68.9	2.1	509
6/30	66	2	9.8	1	24.6	2.5	528
6/30	67	1	13.5	2	35.7	2.6	559
6/30	68	2	13.8	5	86.8	2.5	559
6/30	69	1	13.3	7	126.6	2.1	525
6/30	70	2	13.5	7	124.5	2.3	509
6/30	71	1	11.5	8	167.6	1.9	510
6/30	72	2	11.2	5	106.8	2.8	549
7/01	73	1	13.4	4	71.5	2.7	551
7/01	74	2	11.7	2	41.2	2.1	520
7/01	75	1	13.2	5	90.8	2.3	539
7/01	76	2	13.3	5	90.6	2.7	571
7/01	77	1	11.1	8	173.8	2.1	537
7/01	78	2	13.5	10	177.8	2.4	516
7/01	79	1	12.7	9	170.1	2.6	530
7/01	80	2	9.2	11	286.6	2.9	549

-Continued-

APPENDIX C: UGASHIK RIVER (p 3 of 8)

C.1. (p 3 of 4).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/02	81	1	10.9	5	110.5	2.2	513
7/02	82	2	14.0	13	223.6	1.9	532
7/02	83	1	9.3	8	205.9	2.7	534
7/02	84	2	7.8	7	215.2	2.1	524
7/02	85	1	11.0	11	239.7	2.4	541
7/02	86	2	10.9	8	177.0	2.7	543
7/02	87	1	9.1	9	237.0	2.5	546
7/02	88	2	10.8	5	111.0	2.8	544
7/03	89	1	9.4	18	459.1	2.7	542
7/03	90	2	8.0	23	687.9	2.8	546
7/03	91	1	5.5	26	1,138.7	2.7	540
7/03	92	2	5.6	31	1,334.5	3.0	549
7/04	93	1	12.2	24	471.2	2.8	544
7/04	94	2	7.5	15	477.8	2.5	538
7/04	95	1	5.4	15	664.8	2.8	541
7/04	96	2	3.8	29	1,838.8	3.0	564
7/05	97	1	4.6	62	3,238.3	2.5	538
7/05	98	2	3.4	37	2,642.9	2.7	536
7/05	99	1	3.5	50	3,478.3	2.7	535
7/05	100	2	2.4	35	3,500.0	2.5	520
7/06	101	1	3.6	38	2,554.6	2.1	528
7/06	102	2	3.2	53	3,932.0	2.7	541
7/06	103	1	3.6	34	2,276.2	2.6	546
7/06	104	2	3.1	36	2,805.2	2.4	537
7/07	105	1	3.2	43	3,215.0	2.6	538
7/07	106	2	1.9	32	3,958.8	2.7	532
7/07	107	1	2.7	43	3,808.1		
7/07	108	2	3.1	24	1,870.1		
7/08	109	1	3.1	31	2,419.5		
7/08	110	2	3.1	20	1,538.5		
7/09	111	1	5.4	20	893.0	2.6	529
7/09	112	2	5.2	16	737.0	2.7	542
7/09	113	1	4.6	16	843.0	3.1	546
7/09	114	2	4.2	51	2,890.2	2.7	543
7/10	115	1	2.3	44	4,652.0		
7/10	116	2	2.2	67	7,342.5		
7/10	117	1	3.6	29	1,928.0	2.5	537
7/10	118	2	3.6	56	3,754.2	2.4	525

-Continued-

APPENDIX C: UGASHIK RIVER (p 4 of 8)

C.1. (p 4 of 4).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/11	119	1	3.8	65	4,132.5	2.3	525
7/11	120	2	2.3	34	3,540.1	2.7	521
7/11	121	1	2.7	30	2,701.7	2.7	532
7/11	122	2	2.6	37	3,389.3	2.8	534
7/12	123	1	3.2	22	1,627.1		
7/12	124	2	3.5	30	2,051.3		
7/12	125	1	2.2	28	3,020.2	1.9	512
7/12	126	2	2.7	23	2,063.6	2.5	550
7/13	127	1	3.0	29	2,316.1		
7/13	128	2	3.5	28	1,909.1		
7/13	129	1	5.1	22	1,028.2	2.7	541
7/13	130	2	5.9	28	1,144.8	2.6	532
7/14	131	1	6.6	11	399.1	2.4	548
7/14	132	2	7.8	17	524.1	2.5	541
7/14	133	1	8.8	18	492.3	2.5	522
7/14	134	2	7.1	15	505.6	2.0	527
7/15	135	1	11.9	5	101.2		
7/15	136	2	11.0	4	87.0		
7/15	137	1	11.6	17	351.7	2.2	511
7/15	138	2	11.3	16	341.3	2.4	511

APPENDIX C: UGASHIK RIVER (p 5 of 8)

C.2. Age, sex, and size composition of sockeye salmon caught in the Ugashik River test fishery, 1991.

	Age Group					Total
	0.3	1.2	1.3	2.2	2.3	
<u>All Periods Combined</u>						
	<u>MALES</u>					
Percent	0.26	10.39	26.75	21.04	2.60	61.04
Sample Size	3	120	309	243	30	705
Mean Length	552	509	571	516	578	542
Std. Error	20	2	2	2	5	1
Sample Size	3	117	303	242	29	694
Mean Weight	2.70	2.20	3.18	2.37	3.32	2.74
Std. Error	0.41	0.14	0.05	0.05	0.13	0.04
Sample Size	3	50	120	97	11	281
	<u>FEMALES</u>					
Percent	0.61	4.33	19.48	12.38	2.16	38.96
Sample Size	7	50	225	143	25	450
Mean Length	546	493	544	500	551	525
Std. Error	3	3	2	2	5	1
Sample Size	7	50	222	143	25	447
Mean Weight	2.60	1.81	2.56	1.89	2.40	2.26
Std. Error	0.02	0.07	0.04	0.05	0.06	0.03
Sample Size	2	15	75	44	7	143
	<u>ALL FISH</u>					
Percent	0.87	14.72	46.23	33.42	4.76	100.00
Sample Size	10	170	534	386	55	1,155
Mean Length	548	504	560	510	566	535
Std. Error	6	2	1	1	4	1
Sample Size	10	167	525	385	54	1,141
Mean Weight	2.63	2.09	2.92	2.19	2.90	2.55
Std. Error	0.12	0.10	0.04	0.03	0.08	0.02
Sample Size	5	65	195	141	18	424

APPENDIX C: UGASHIK RIVER (p 6 of 8)

C.3. Test-fishing data, 1979-1990, to estimate constants for 1991 Ugashik River catchability model.

Year	Weighted Season Mean		Travel Time (days)	Indices		Spawning Escapement		EPI	Test Fishing Data Reference
	Weight	Length		Cumulative Number	Last Date Fished	Cumulative Number	Date <sup>a</sup>		
1979 <sup>b</sup>	2.6	538	9	42,880	7/13	1,662,348	7/22	39	Meacham (1980)
1980	2.4	519	3	85,711	7/17	2,550,174	7/20	30	Bue and Meacham (1981)
1981 <sup>c</sup>	2.9	560	3	73,861	7/16	1,304,022	7/19	18	Bue (1982)
1982 <sup>d</sup>	3.1	572	4	48,057	7/15	1,120,680	7/19	23	Bue (1984)
1983	2.4	522	1	15,485	7/16	831,744	7/17	54	Yuen (1985)
1984	2.4	523	8	20,138	7/17	1,223,286	7/25	61	Yuen et al. (1985)
1985 <sup>e</sup>	2.3	536	7	30,903	7/16	997,026	7/26	32	Bue et al. (1988)
1986	2.9	562	9	36,786	7/15	1,001,492	7/24	27	Yuen et al. (1988)
1987 <sup>f</sup>	2.6	547	6	14,393	7/17	587,964	7/23	41	Fried and Bue (1988a)
1988	2.7	549	2	16,106	7/24	625,752	7/26	39	Fried and Bue (1988b)
1989	2.4	532	5	36,562	7/21	1,669,350	7/26	46	Stratton et al. (1990)
1990	2.7	533	3	20,113	7/20	692,310	7/23	34	Stratton (1990)
Mean	2.6	541	5					37	
1991 <sup>g</sup>	2.6	534	4	27,359	7/15	2,255,216	7/19	82	Current Report

<sup>a</sup> Cumulative spawning escapement date is last date fished at test fishing site plus travel time to counting tower site.

<sup>b</sup> Three fishing sites used from 1979-1980: station 1 on east bank about 1 km below Ugashik Village; stations 2 and 3 on west bank about 4 km and 5 km above Ugashik Village.

<sup>c</sup> Two sites used from 1981 to present: station 1 on east bank located about 7 km upriver of Ugashik Village; station 2 on west bank located about 8 km upriver of Ugashik Village.

<sup>d</sup> Stations 1 and 2 moved about 2 km and 3 km downriver.

-Continued-

C.3. (page 2 of 2)

- 
- <sup>e</sup> Data from 1985-present may not be comparable with those from 1979-1984 because gillnets with a smaller stretched mesh size (13.02 cm instead of 13.65 cm) and different web material (multi-strand monofilament instead of multifilament nylon) were used.
- <sup>f</sup> Stations 1 and 2 moved about 3 km upriver.
- <sup>g</sup> Catchability model for 1992:  $EPI_m = (1.257 \times 10^{25}) M_{\bar{i}}^{-8.609}$  where  $M_{\bar{i}}$  = weighted mean length.

APPENDIX C: UGASHIK RIVER (p 8 of 8)

Appendix C.4. Climatological and hydrological observations made at Ugashik River sockeye salmon test-fishing site, 1991.

Date	Cloud Cover <sup>a</sup>		Wind Velocity (km/hr)		Air Temp. (°C)		Water Temp. (°C)		Precipitation <sup>b</sup>	Water Clarity
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.		
6 21	1	1	10-15 SE	10-15 SE	-	-	-	-	0	dk. brown
6 22	1	4	0- 5 SE	15-20 SE	-	-	12	13	A	dk. brown
6 23	4	4	20-25 NW	25-30 W	-	-	11	13	B	dk. brown
6 24	4	4	15-20 SE	10-15 SE	-	-	13	12	B	dk. brown
6 25	4	5	5-10 SW	0- 5-SE	-	-	11	12	A	dk. brown
6 26	3	4	15-20 SW	15-20-SSW	-	-	10	11	A	dk. brown
6 27	4	5	15-20 W	10-15 W	-	-	11	12	A	dk. brown
6 28	4	5	5-10 W	0- 5 W	-	-	11	12	A	dk. brown
6 29	2	3	10-15 SW	5-10 SSW	-	-	10	10	0	dk. brown
6 30	4	4	5-10 W	0- 5 SSW	-	-	10	10	A	dk. brown
7 1	3	4	calm	5-15 SE	-	-	9	10	A	dk. brown
7 2	4	4	5-10 SW	5-10 W	-	-	9	11	B	dk. brown
7 3	3	4	calm	calm	-	-	10	10	0	dk. brown
7 4	1	2	calm	0- 5 S	-	-	11	12	A	dk. brown
7 5	2	5	calm	5-10 SE	-	-	11	12	A	dk. brown
7 6	4	4	0- 5 W	5-10 SE	-	-	12	12	A	dk. brown
7 7	4	5	0- 5 W	5-10 SW	-	-	12	12	0	dk. brown
7 8	2	5	10-15 SE	10-15 W	-	-	11	12	A	dk. brown
7 9	4	4	5-15 SW	10-20 SW	-	-	12	12	A	dk. brown
7 10	4	4	5-15 SSW	5-10 SW	-	-	10	11	A	dk. brown
7 11	4	4	5-10 SE	0- 5 SE	-	-	11	12	0	dk. brown
7 12	3	3	0- 5 E	0- 5 E	-	-	12	13	0	dk. brown
7 13	4	-	0- 5 SE	0- 5 SE	-	-	13	15	0	dk. brown
7 14	4	4	5-10 E	5-10 E	-	-	12	13	0	dk. brown
7 15	4	4	5-10 SW	0- 5 SW	-	-	13	13	0	dk. brown
7 16	4	-	0- 5 W	-	-	-	12	-	0	dk. brown

<sup>a</sup> 1 = cloud cover not more than 1/10, 2 = cloud cover not more than 1/2, 3 = cloud cover more than 1/2, 4 = completely overcast, and 5 = fog

<sup>b</sup> 0 = none; A = intermittent rain; B = continuous rain

APPENDIX D: IGUSHIK RIVER

D.1. Sockeye salmon test-fishing data, Igushik River, 1991.

---

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/18	1	2	5.7	0	0.0		
6/18	2	1	3.8	0	0.0		
6/18	3	2	5.8	0	0.0		
6/18	4	1	5.1	0	0.0		
6/18	5	2	8.8	0	0.0		
6/18	6	1	5.2	0	0.0		
6/19	7	1	14.8	1	16.2		
6/19	8	2	6.4	0	0.0		
6/19	9	1	8.8	0	0.0		
6/19	10	2	7.1	0	0.0		
6/19	11	1	9.6	0	0.0		
6/19	12	2	8.3	0	0.0		
6/19	13	1	7.5	0	0.0		
6/19	14	2	9.4	0	0.0		
6/20	15	1	6.7	0	0.0		
6/20	16	2	6.0	0	0.0		
6/20	17	1	8.1	0	0.0		
6/20	18	2	7.6	0	0.0		
6/20	19	1	5.8	0	0.0		
6/20	20	2	6.6	0	0.0		
6/20	21	1	6.1	0	0.0		
6/20	22	2	6.5	0	0.0		
6/21	23	1	7.8	0	0.0		
6/21	24	2	6.7	0	0.0		
6/21	25	1	11.7	0	0.0		
6/21	26	2	9.7	0	0.0		
6/21	27	1	7.6	0	0.0		
6/21	28	2	8.6	0	0.0		
6/21	29	1	10.4	0	0.0		
6/21	30	2	10.2	0	0.0		
6/22 <sup>a</sup>	31	1	8.7	0	0.0		
6/22	32	2	8.4	0	0.0		
6/22	33	1	6.2	0	0.0		
6/22	34	2	12.0	0	0.0		
6/23 <sup>b</sup>	35	1	9.8	0	0.0		
6/23	36	2	8.5	2	56.7	2.9	555
6/23	37	1	8.9	0	0.0		

---

-Continued-

APPENDIX D: IGUSHIK RIVER (p 2 of 10)

D.1. (p 2 of 6).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/23	38	2	9.1	0	0.0		
6/23	39	1	4.6	7	362.1	2.7	537
6/24	40	1	4.8	1	50.3		
6/24	41	2	5.7	0	0.0		
6/24	42	1	5.5	0	0.0		
6/24	43	2	7.1	0	0.0		
6/24	44	1	1.7	20	2,807.0	3.0	540
6/24	45	2	6.5	0	0.0		
6/24	46	1	2.5	14	1,371.0	3.3	562
6/24	47	2	6.0	0	0.0		
6/25	48	1	6.1	2	78.5		
6/25	49	2	8.9	0	0.0		
6/25	50	1	8.0	1	29.9		
6/25	51	2	5.8	0	0.0		
6/25	52	1	3.9	22	1,362.6	3.0	562
6/25	53	2	5.9	0	0.0		
6/25	54	1	3.9	18	1,100.6	2.7	549
6/25	55	2	7.2	0	0.0		
6/26	56	1	5.9	0	0.0		
6/26	57	2	6.7	0	0.0		
6/26	58	1	7.2	1	33.3	3.3	591
6/26	59	2	6.9	0	0.0		
6/26	60	1	3.9	8	496.8	2.6	541
6/26	61	2	5.5	3	131.3	3.8	573
6/26	62	1	2.8	9	766.0	2.7	587
6/26	63	2	6.3	0	0.0		
6/27	64	1	10.4	0	0.0		
6/27	65	2	8.3	0	0.0		
6/27	66	1	9.7	0	0.0		
6/27	67	2	8.1	0	0.0		
6/27	68	1	6.9	0	0.0		
6/27	69	2	8.4	1	32.8	3.5	610
6/27	70	1	7.3	1	28.6	4.2	614
6/27	71	2	9.0	0	0.0		
6/28	72	1	11.1	0	0.0		
6/28	73	2	8.6	0	0.0		
6/28	74	1	7.3	0	0.0		

-Continued-

APPENDIX D: IGUSHIK RIVER (p 3 of 10)

D.1. (p 3 of 6).

---

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
6/28	75	2	7.4	0	0.0		
6/28	76	1	7.4	1	32.5	2.4	527
6/28	77	2	10.0	4	96.1	3.5	579
6/28	78	1	7.2	2	66.9	2.8	534
6/28	79	2	9.7	1	24.6	2.9	554
6/29	80	1	5.9	0	0.0		
6/29	81	2	9.2	0	0.0		
6/29	82	1	6.5	0	0.0		
6/29	83	2	9.3	1	25.9	2.9	572
6/29	84	1	10.0	2	48.0	3.3	572
6/29	85	2	8.5	3	84.8	3.7	560
6/29	86	1	10.4	1	23.1	3.1	562
6/29	87	2	13.8	15	260.6	3.1	523
6/30	88	1	12.1	0	0.0		
6/30	89	2	7.8	0	0.0		
6/30	90	1	11.5	1	20.9	3.8	604
6/30	91	2	7.6	0	0.0		
6/30	92	1	6.3	5	191.7	2.6	542
6/30	93	2	6.6	27	980.3	3.1	574
6/30	94	1	6.2	5	192.6	3.5	562
6/30	95	2	9.6	27	673.6	3.3	595
7/01	96	1	6.6	0			
7/01	97	2	7.4	0	0.0		
7/01	98	1	6.0	0	0.0		
7/01	99	2	6.2	3	116.0	3.3	573
7/01	100	1	7.8	2	61.2	2.7	563
7/01	101	2	3.3	38	2,763.6	3.3	548
7/01	102	1	7.6	0	0.0		
7/01	103	2	3.9	23	1,401.0	3.1	564
7/02	104	1	7.4	1	32.5	2.6	530
7/02	105	2	5.5	3	131.3	2.7	585
7/02	106	1	8.7	1	27.6	2.7	557
7/02	107	2	6.1	2	78.5	2.5	556
7/02	108	1	4.4	2	108.2	3.6	567
7/02	109	2	3.7	42	2,702.4	3.4	577
7/02	110	1	4.3	3	168.8	3.2	568
7/02	111	2	1.3	23	4,197.8	3.1	553

---

-Continued-

APPENDIX D: IGUSHIK RIVER (p 4 of 10)

D.1. (p 4 of 6).

---

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/03	112	1	5.3	5	225.6	3.4	559
7/03	113	2	1.4	15	2,535.2	3.2	548
7/03	114	1	3.8	4	256.0	2.5	555
7/03	115	2	1.5	13	2,087.0	3.1	557
7/03	116	1	3.8	10	637.5	2.7	558
7/03	117	2	1.3	18	3,260.4	3.1	574
7/03	118	1	4.8	7	350.4	3.1	562
7/03	119	2	3.8	20	1,353.3	3.2	559
7/04	120	1	3.2	11	827.6	3.1	558
7/04	121	2	1.7	17	2,472.7	3.0	555
7/04	122	1	2.9	5	415.2	3.4	569
7/04	123	2	3.4	25	1,741.7	2.9	558
7/04	124	1	3.8	6	380.4	3.4	573
7/04	125	2	2.6	23	2,114.9	3.4	572
7/04	126	1	3.0	4	315.8	2.3	530
7/04	127	2	3.3	17	1,219.7	3.0	562
7/05	128	1	5.8	8	331.6	3.7	565
7/05	129	2	5.7	1	41.8	2.4	518
7/05	130	1	6.8	12	425.4	3.3	549
7/05	131	2	7.0	3	103.6	2.3	513
7/05	132	1	5.6	2	86.4	3.4	579
7/05	133	2	6.1	2	78.1	2.9	553
7/05	134	1	5.1	0	0.0		
7/05	135	2	8.0	1	29.9	2.2	536
7/06	136	1	4.5	9	483.2	3.1	584
7/06	137	2	3.2	19	1,405.2	3.2	569
7/06	138	1	4.4	19	1,044.7	2.6	570
7/06	139	2	3.6	19	1,251.0	2.2	565
7/06	140	1	3.9	1	62.3		
7/06	141	2	5.1	0	0.0		
7/06	142	1	6.3	0	0.0		
7/06	143	2	4.8	1	50.5	3.5	593
7/07	144	1	5.0	7	334.7	3.4	564
7/07	145	2	7.7	1	31.0	2.6	535
7/07	146	1	4.3	10	557.5	3.0	518
7/07	147	2	3.5	0	0.0		
7/07	148	1	6.3	2	75.9	2.8	528

---

-Continued-

APPENDIX D: IGUSHIK RIVER (p 5 of 10)

D.1. (p 5 of 6).

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/08	149	2	8.3	1	29.0	3.2	578
7/08	150	1	7.4	0	0.0		
7/08	151	2	7.8	1	31.0	3.0	532
7/08	152	1	5.1	1	46.8	2.8	559
7/08	153	2	7.8	3	92.5	2.5	565
7/08	154	1	6.4	2	74.5	3.7	579
7/08	155	2	7.0	4	138.1	3.0	551
7/09	156	1	5.3	0	0.0		
7/09	157	2	6.4	0	0.0		
7/09	158	1	5.4	0	0.0		
7/09	159	2	5.6	0	0.0		
7/09	160	1	4.3	2	111.2	3.1	541
7/09	161	2	5.3	6	273.2	3.0	551
7/09	162	1	5.1	1	47.0	4.0	587
7/09	163	2	5.4	5	221.4	2.7	561
7/10	164	1	5.4	0	0.0		
7/10	165	2	4.8	0	0.0		
7/10	166	1	6.1	0	0.0		
7/10	167	2	6.1	0	0.0		
7/10	168	1	6.4	8	298.1	2.3	555
7/10	169	2	6.3	2	79.2	3.7	561
7/10	170	1	4.9	12	589.0	3.3	549
7/10	171	2	6.4	4	149.3	3.4	591
7/11	172	1	3.2	2	147.9	3.7	591
7/11	173	2	3.1	0	0.0		
7/11	174	1	3.7	1	64.3	3.0	559
7/11	175	2	4.0	0	0.0		
7/11	176	1	7.1	18	611.9	2.7	537
7/11	177	2	5.1	2	94.4	3.4	520
7/11	178	1	6.4	12	450.4	3.2	563
7/11	179	2	2.1	9	1,007.0	3.4	532
7/12	180	1	6.1	1	39.1	3.3	550
7/12	181	2	5.8	0	0.0		
7/12	182	1	5.6	0	0.0		
7/12	183	2	4.9	0	0.0		
7/12	184	1	6.3	3	113.5	3.0	535
7/12	185	2	6.4	0	0.0		

-Continued-

APPENDIX D: IGUSHIK RIVER (p 6 of 10)

D.1. (p 6 of 6).

---

Date	Set No.	Station	Mean Fishing Time (min)	Sockeye Catch	Test Fishing Index	Mean Weight (kg)	Mean Length (mm)
7/12	186	1	4.8	4	198.6	2.4	532
7/12	187	2	6.8	2	70.6	2.2	529
7/13	188	1	5.1	3	140.4	3.1	539
7/13	189	2	5.7	1	42.2	2.9	565
7/13	190	1	4.8	2	100.3	2.4	551
7/13	191	2	6.2	0	0.0		
7/13	192	1	5.3	1	45.3	3.9	611
7/13	193	2	2.0	15	1,791.0	3.2	530
7/13	194	1	5.0	2	95.2	3.5	568
7/13	195	2	4.9	15	731.7	2.5	523
7/14	196	1	5.8	0	0.0		
7/14	197	2	4.1	1	59.3	2.4	507
7/14	198	1	4.2	0	0.0		
7/14	199	2	4.3	0	0.0		
7/14	200	1	5.3	0	0.0		
7/14	201	2	6.0	5	201.7	3.3	550
7/14	202	1	4.3	0	0.0		
7/14	203	2	5.8	2	83.0	3.9	565
7/15	204	1	6.1	0	0.0		
7/15	205	2	5.3	0	0.0		
7/15	206	1	5.4	0	0.0		
7/15	207	2	5.0	0	0.0		
7/15	208	1	4.6	0	0.0		
7/15	209	2	5.9	2	81.5		
7/15	210	1	5.2	0	0.0		
7/15	211	2	6.3	1	38.3		

---

<sup>a</sup> Four drifts missed due to high winds and rough water

<sup>b</sup> Three drifts missed due to high winds and rough water

APPENDIX D: IGUSHIK RIVER (p 7 of 10)

D.2. Age, sex, and size composition of sockeye salmon caught in the Igushik River test fishery, 1991

	Age Group						Total
	0.3	1.2	1.3	2.2	1.4	2.3	
<u>MALES</u>							
Percent		0.92	42.44	0.15		0.92	44.43
Sample Size		6	278	1		6	291
Mean Length		543	583	538		595	582
Std. Error		16	2			9	2
Sample Size		6	227	1		6	290
Mean Weight		2.87	3.62			3.70	3.62
Std. Error		0.37	0.05				0.04
Sample Size		3	86			1	90
<u>FEMALES</u>							
Percent	0.15	3.05	51.30		0.15	0.92	55.57
Sample Size	1	20	336		1	6	364
Mean Length	543	493	542		535	546	539
Std. Error		5	1			18	1
Sample Size	1	20	335		1	6	363
Mean Weight	2.80	2.50	2.71		2.70	2.80	2.70
Std. Error		0.24	0.03				0.03
Sample Size	1	6	100		1	1	109
<u>ALL FISH</u>							
Percent	0.15	3.97	93.74	0.15	0.15	1.83	100.00
Sample Size	1	26	614	1	1	12	655
Mean Length	543	504	560	538	535	570	558
Std. Error		5	1			10	1
Sample Size	1	26	612	1	1	12	653
Mean Weight	2.80	2.59	3.13		2.70	3.25	3.11
Std. Error		0.21	0.03				0.03
Sample Size	1	9	186		1	2	199

APPENDIX D: IGUSHIK RIVER (p 8 of 10)

D.3. Igushik River sockeye salmon test-fishing data, 1979-1989, and 1991.

Year	Weighted Season Mean		Travel Time <sup>a</sup> (days)	Indices		Spawning Escapement		EPI	Test Fishing Data Reference <sup>d</sup>
	Weight <sub>b</sub>	Length		Cumulative Number	Last Date Fished	Cumulative Number	Date <sup>c</sup>		
1979 <sup>e</sup>	3.4	556	2	45,013	7/13	787,542	7/15	17	McBride and Clark (1980)
1980 <sup>e</sup>	3.1	560	4	38,673	7/15	1,945,758	7/19	50	McBride (1981)
1981 <sup>e</sup>	3.2	572	4	37,975	7/14	532,896	7/18	14	Minard (1982)
1982 <sup>e</sup>	3.5	579	5	12,638	7/12	411,420	7/17	33	Bucher (1984)
1983 <sup>e</sup>	2.8	546	4	15,322	7/13	161,754	7/17	11	Bucher and Frederickson (1985)
1984 <sup>e</sup>	3.2	570	3	25,743	7/14	162,054	7/17	6	Yuen et al. (1985)
1985 <sup>f</sup>	2.6	543	5	15,347	7/11	199,386	7/16	13	Bue et al. (1988)
1986 <sup>f</sup>	3.2	574	4	18,288	7/14	262,104	7/18	14	Yuen et al. (1988)
1987 <sup>f</sup>		557	5	6,609	7/14	138,186	7/19	21	Fried and Bue (1988a)
1988 <sup>f,g</sup>		552	2	6,186	7/13	160,446	7/15	26	Fried and Bue (1988b)
1989 <sup>f,g</sup>		547	1	11,802	7/08	296,658	7/09	25	Stratton et al. (1990)
Mean	3.1	560	4					21	
1991 <sup>f,g</sup>	3.1	557	3	7,431	7/15	721,314	7/18	97	Current Report

<sup>a</sup> Estimates for 1979-83 based on correlation coefficients; estimates for 1984-present based on travel time analysis.

<sup>b</sup> Weight data from 1979-86, and 1991.

-Continued-

D.3 (p 2 of 2).

- 
- <sup>c</sup> Cumulative spawning escapement date is last date fished at test fishing site plus travel time to counting tower site.
  - <sup>d</sup> Weighted season mean length, weight, travel time, and EPI values for 1979-86 were recalculated for 1987 report (Fried and Bue 1988a), and may differ from those in original reports.
  - <sup>e</sup> Only one site, station 1, used on south bank about 30 km upstream from district boundary.
  - <sup>f</sup> Station 1 moved about 2 km downstream, and Station 2 added on north bank about 1 km downstream of Station 1.
  - <sup>g</sup> Data may not be comparable with prior years due to change in fishing method (drifting gillnet from boat rather than anchoring one end on shore).

APPENDIX D: IGUSHIK RIVER (p 10 of 10)

Appendix D.4. Climatological and hydrological observations made at Igushik River sockeye salmon test-fishing site, 1991.

Date	Cloud Cover <sup>a</sup>		Wind Velocity (km/hr)		Air Temp. (°C)		Water Temp. (°C)		Precipitation <sup>b</sup>			Water Clarity
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	Amt. (mm)	
6 18	3	3	10 NE	15 NE	-	13	11	11	0	A	0	dk. brown
6 19	2	4	5 SW	5 SW	12	13	11	12	0	A	0	dk. brown
6 20	3	3	5 SW	0	12	14	12	12	0	0	0	dk. brown
6 21	1	1	5 SW	5 SW	12	16	12	12	0	0	0	dk. brown
6 22	3	3	10 SW	25 SW	12	15	12	13	0	0	0	dk. brown
6 23	4	4	35 SW	40 SW	12	10	13	13	A	A	10	dk. brown
6 24	4	4	20 E	10 E	11	14	13	13	A	A	5	dk. brown
6 25	4	4	5 SW	5 SW	11	14	13	13	A	A	2	dk. brown
6 26	4	4	5 SW	5 SW	12	15	13	13	A	A	0	dk. brown
6 27	3	3	0	0	12	16	13	14	A	A	-	dk. brown
6 28	3	3	5-10 SW	10 SW	13	17	14	14	0	A	0	dk. brown
6 29	3	3	0	10 SW	13	18	14	14	A	A	0	dk. brown
6 30	2	3	0	0-5 SW	15	20	14	15	0	0	0	dk. brown
7 1	2	2	0	0	15	20	15	15	0	0	0	dk. brown
7 2	2	2	10 SW	15 SW	15	18	16	16	0	0	0	dk. brown
7 3	1	1	10-15 SW	10-15 SW	14	19	16	16	0	0	0	dk. brown
7 4	1	1	5 SW	10 NE	14	20	16	17	0	0	0	dk. brown
7 5	2	3	5 SW	5 SW	14	13	16	16	0	A	1	dk. brown
7 6	2	2	5 SW	5 SW	14	15	17	17	0	0	0	dk. brown
7 7	3	3	5 S	5 S	14	19	18	18	A	A	0	dk. brown
7 8	2	2	5 NW	5 NW	18	26	18	18	0	0	0	dk. brown
7 9	3	4	5 S	5 S	19	25	18	19	0	A	0	dk. brown
7 10	1	1	15 N	15 N	17	23	18	18	0	0	0	dk. brown
7 11	2	3	20 S	25-30 S	18	20	18	17	0	0	0	dk. brown
7 12	4	3	20 N	20 N	15	19	16	16	0	0	0	dk. brown
7 13	3	4	10 N	20 N	14	15	16	16	0	0	0	dk. brown
7 14	2	2	15 S	10 S	13	16	15	15	0	0	0	dk. brown
7 15	3	-	25 SW	-	15	15	15	15	0	-	-	dk. brown

<sup>a</sup> 1 = cloud cover not more than 1/10, 2 = cloud cover not more than 1/2, 3 = cloud cover more than 1/2, 4 = completely overcast, and 5 = fog

<sup>b</sup> 0 = none; A = intermittent rain; B = continuous rain

The Alaska Department of Fish and Game receives federal funding. All of its public programs and activities are operated free from discrimination on the basis of race, religion, sex, color, national origin, age, or handicap. Any person who believes he or she has been discriminated against by this agency should write to: OEO, U.S. Department of the Interior, Washington, DC 20240.